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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

September Meeting, Society of Gas Lighting.

OFFICE OF THE SECRETARY, Sept. 3, 1896.

The September meeting of the Society of Gas Lighting will be held in "The Arena," No. 39 West 31st street, New York city, on Thursday, September 10th, at 3 P.M. FRED. S. BENSON, Secretary.

BRIEFLY TOLD.

"GAS VERSUS ELECTRICITY DIRECT FROM COAL."—The September number of the *Engineering Magazine* contains a most interesting article on the matter of "Gas versus Electricity Direct from Coal," the lines of which were prepared by Mr. D. M. Dunning, the clever and vigorous Manager of the Auburn (N. Y.) Gas Light Company. His presentation of the subject is most effective, since it is concise, but without leaving too much to the inference of the reader for his completing, and is in fair defence and positive extolling of the gas industry without being open in any sense to the honest charge that its praises thereof are either exaggerated or over-enthusiastic. Mr. Dunning has a decidedly proved knack of putting things just as they exist, but even his hardest positives are so garbed in a texture of humor that the electricians who ponder over his paper, while they may make wry nods at its hard facts, will have to relax their sternness to the point of at least smiling, ruefully though it be, at the droll raillery with which the hard knocks are administered. Mr. Dunning, for instance, preludes his subject by remarking, "For a number of years we have heard of the great things that were to happen when science achieved the production of 'electricity direct from coal;' yet it does not seem to have occurred to many that ordinary illuminating gas is, and always has been, produced 'direct from coal.'" And in this simple statement Mr. Dunning would seem to have said about all there is to be said respecting his subject—for what he declares to be a living fact can be proved in any locality in which a coal gas works is operated. The coal, in the ordinary process of gas making, is baked, and the gas is made; nor is the coal destroyed, for by far the greater weight of the material is transformed into coke, ready for use in other channels of industry. In fact, the gas maker is one of the fortunates who, having eaten his cake, still has the greater part of it to eat again. Possibly it would be still more advantageous if he could convert the coal completely into gas, but even that is doubtful. However, what with the coke and the tar and the ammoniacal liquor, and even the fouled purifying material, all are pretty good helps towards "conserving the energy obtained from direct coal baking." Of course, Mr. Dunning, in his contribution to *Engineering's* pages, does not forget to bring out all these advantages which are the gas makers'. To be concise about it, he submits that "at the gas works in charge of the writer, 400 miles from the coal mines, the residuals sold pay more than 80 per cent. of the coal bill." Nor does he take exceeding credit to himself on that account, just mentioning the circumstance as worthy of note in a general way. We would like to reproduce the article in our columns—in fact, had we known that Mr. Dunning was disposed to write up the subject he could have obtained quite as

good terms for it from us as from Editor Dunlap—but the urbane literary manager of *Engineering Magazine* naturally objects to a "borrowing of his thunder;" and so we say to all of our readers that a purchase by them of the September number of the named publication will be a good investment.

NOTES.—A certificate incorporating the Baldwinsville (N. Y.) Heat and Light Company has been filed. The capital stock is put at $20,000, and the provisional Directors are: William F. Morris, James W. Upson, Wm. H. Hoffman, James W. Stearns, Bartlett Smith, William H. Wells and John T. Wilkins. The Company proposes to "obtain and supply natural and artificial gas for light, heat and power." This place is a post village of Onondaga county, N.Y., and is on the Seneca river and the Oswego and Syracuse Railroad, at a point about 12 miles northwest of Syracuse. It is a busy place, and has within it flouring mills, a foundry and a woollen factory. Population, about 3,500.——Mr. Frank M. Bowers, General Foreman of the Kansas City (Mo.) Gas Company, was genuinely surprised some evenings ago. He had reported for home duty to Mrs. Bowers at 6 o'clock, and an hour or so later a ring from the hall gong brought the "maid" to him with the announcement that "the house was being mobbed." The poor girl didn't know, you know; a crowd covered the steps and "overflowed" to the sidewalk, but Bowers and his household were in no danger. The upshot of the whole thing was that, when Mr. T. W. L. McGuire had concluded a very well-worded and well-spoken speech, Mr. Bowers was the possessor of a handsome gold watch and chain. The testimonial was the gift of the men under his immediate charge, and the presentation was made on the occasion of the recipient's 51st birthday anniversary.——The authorities of Pawtucket, R. I., have negatived the scheme to establish a municipal electric lighting plant there.——Mr. G. N. Clapp has been elected to the Directorate of the Middletown (N. Y.) Gas Company. His election to the Board means that he has virtually succeeded to the ownership of the Company, and further implies that the plant will be improved to the point where it will become a money earner instead of a money absorber.——In the case entitled "The Consolidated Gas Company, of Baltimore, vs. Crocker, 82 Maryland, 113 L.R.A., 785," it is held that the failure of a gas company to exercise any care in discovering and repairing a leak, which proved to be in its street main, when notified that gas is escaping into the cellar of a building abutting on the street, is sufficient to render the company negligent and responsible for injuries caused by such escape of gas. The court further declared "That whether it is negligent or not for an explorer to search for a gas escape with the aid of a naked light rests with the jury; who must be guided in their determination by the evidence surrounding the case under trial."——The officers of the corporation which has succeeded to the properties of the Fishkill and Matteawan (N. Y.) Gas Light Company are: President, Howell C. Rees; Vice-President, William A. Rees; Secretary and Treasurer, Robert Goeller.——The proprietors of the Fairbault (Minn.) Gas and Electric Light Company have applied to the authorities for an extension of their franchise.——In our item columns will be found a paragraph to the effect that the Board of Public Works, of Denver, Colorado, had asked the Denver Consolidated Gas Company "to pay $3,000 towards the amount necessary for the repaving of certain Denver streets with asphalt." While in the main that statement is true, the following copy of the resolution adopted by the Board of Public Works, in respect of the demand made upon the Company, which was forwarded by a correspondent, goes to show that the city's request was rather more reasonable than would be inferred from the lines of the item: "*Resolved*, That the Denver Consolidated Gas Company be directed to make a deposit with the City Treasurer of Denver, in the sum of $3,000, to pay for the cost of repairs where the damage may be found by this Board to be caused by defects in its system of underground service."——The increase in the use of gas for purposes other than lighting in New York during the past summer was nothing short of phenomenal. And the greater per cent. of credit for the results achieved must go to the men in charge of the appliances' departments. In the latter, courtesy, patience and perseverance are practiced in far greater degree than in the counting rooms proper of the city companies.——The Brooklyn Union Gas Company has virtually abandoned the plant of the old Brooklyn works as a generating station. It may have been a good move; but the old site was an ideal one for the economical manufacture and distribution of gas.——The Directors of the Equitable Gas Light Company, of Memphis, Tenn., have declared the regular quarterly dividend of 1 per cent., payable October 1st.——Mr. C. Newman, the Gas Inspector for San Francisco, declares that on certain streets of that city there are either too many gas lamps or too many arc lights. Lucky San Francisco; bright-eyed Mr. Newman.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONCLUDED FROM PAGE 331.]

FOURTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

HELD IN SAN FRANCISCO, CAL., JULY 21 AND 22, 1896.

SECOND DAY—AFTERNOON SESSION.

Mr. John Clements, of Red Bluff, Cal., then gave the following recital of matters collected in connection with his appointment to manage the

EXPERIENCE

branch of the Association.

Mr. President and fellow members of the Pacific Coast Gas Association—At the last meeting of our Association I happened, in the course of a few remarks, to speak some words of praise of my friend Parker, which I said then, and repeat now, he justly deserved. In the course of my remarks I mentioned the fact that I had been on a short visit to my friend and found him hard at work completing the duties that had been laid upon him. For some reason our President, in again appointing Mr. Parker Editor of the Wrinkle Department, chose to name me as his assistant to act in concert with him. At the time, and even until now, I failed to see how I could be, or have been, of any assistance to him. My reason for saying this is that my experience, as compared with my associate, is as nothing; then, we were to be separated by a distance of 200 miles, and it would be next to impossible for us to have personal interviews with each other, a thing to my mind which seemed most essential. However, in an humble way, by means of pen and thought, I have done what little I could to help remind the members of the Association that there was a "Wrinkle Department," and that we were out for Wrinkles. Mr. Parker has received, arranged and explained to us the Wrinkles. They no doubt have been of considerable interest and profit to one and all.

During the course of our endeavors to obtain Wrinkles from among the members of the Association, we received some few letters giving written explanations of the manner in which certain work was being done, which could not well be classed as Wrinkles; these, we thought, might be considered profitably under the caption of "Experiences;" and so for the first time, so far as we know, we offer to the gas fraternity the "Department of Experiences."

The first item in this line we have to offer concerns the experience of Mr. Thompson, Superintendent of the Woodland (Cal.) Works. Mr. Thompson has the management of a small gas works, in which he is called upon to do almost everything that is done. He is often required to leave the retort house for hours at a time, thus leaving the retorts and their outputs to take care of themselves. As he says, he has thrown in fires at times when called away, only to come back and find that his fire was low and his returns bad. He sends his experience with a simple device, which he designates as a "banking damper." By the means of this damper he can bank the fire, at the same time retaining the heat and getting better results. He sends photos of his damper. It will be seen that the device fully excludes cold air from grates and prevents the material used for banking from falling back into ash pan, thus saving a considerable amount of labor when cleaning. He claims that he can bank his fire so that it retains the heat, while he is away attending to other duties connected with his plant.

Mr. Grant, of Modesto, Cal., sends us two items. The first refers to the use of Pennsylvania egg coal (Wilkesbarre). He does not claim it as a gas making coal. On the contrary, he finds that it will not produce any light giving quality, but he does claim that for fuel in the fire-box it has no equal. Many of the gentlemen here who are accustomed to handling large plants, in which the fires are never subdued, but burn on and on and on, may not understand how he who manages the small gas works has to study ways and means to keep up his heats without men or fuel. In other words, how he may bank his fires and still retain his heats and keep his retorts in a condition to do good and effective work when required. Mr. Grant says, in substance, that by the use of this coal he has been able to save a considerable amount in cost of fuel, and also to add materially to his sale of coke. He relates that when his stoker fell sick he was obliged to step in and fill the breach, and while thus engaged he undertook the use of this coal (which, by-the-way was not purchased for the gas works) and found that it made a very hot and lasting fire. He was so much pleased with the outcome that he has continued to use it ever since with satisfactory results. Mr. Grant does not give us the cost of this coal laid down on

the Coast, and, therefore, I cannot give as full an account of his experience as I should like to.

Mr. Grant's other experience relates to the removal of some pipe that had been in the ground for 15 or 16 years, which they were obliged to take up in order to lay a larger main. He says they found great difficulty in taking the pipe apart—which, by-the-way, is usually the case. He used chain tongs with leverage enough on them for four men, but this would not do the work. After building fires of wood around the joints he was enabled to move some, but not all, of the screw joints. He then poured gasoline upon the joints and set it on fire, after which it was no trouble to start and remove them all.

Next we have an experience from Mr. Hurley, of Tacoma, Washington. It relates to the repairing of a leaky tank. I can do no better than to read Mr. Hurley's letter, which is as follows:

"The method we adopted for repairing a leaky tank may be deserving of admission to your Department, and also may be of interest in the event any member of the Association should have a similar difficulty.

"Our tank is 80 feet in diameter and 23 feet deep, and as there was not room enough on our property for the bank around the tank, a retaining wall was constructed along the street line. A rough cross-section[1] is here shown.

The bottom of the tank is 20 feet above high tide, and the natural ground from the works, west for about a mile, has an ascending slope of from 30° to 40°. We found the bottom leaking around the toe of the slope for supporting the crown of the holder, also in a number of places on the slope. When the tank was full a stream of water, about three-fourths of an inch in diameter, ran out through the retaining wall at "A," about 4 feet above the ground. I first tried bran in the water, then manure, but with no success. I then emptied the tank and and cemented the leaks, but before the tank could be filled the pressure of the water below would break up the cement. It then became apparent that the water from below must have some other outlet. I dug a well in the street, about 20 feet from the wall of the tank, and to a depth of 5 feet below the bottom, then drilled a hole large enough for a 1½ inch pipe from the tank to the well and cemented the pipe with drain in the bottom of the tank. The water was siphoned out of the well, so as to keep the level of the water below the bottom of the tank. In a day or two after the opening to the well was made the tank was completely drained, and the water ceased running into it through the old cracks. We were then able to cement the walls and bottom, and when the tank was filled it was found perfectly tight.

"The expense of repairing the tank was about $200, but as we reduced our water bill from $55 per month to $8, the money was well expended.'

The next experience we have is from Mr. Gregory, of San Jose. His is a peculiar one, and should call out a considerable discussion among the members.

He states that a neighbor who has a grievance manufactures ice, pumping the water used in ice making from a well 79 feet deep, and cased all the way down with iron casing. This well is not less than 150 feet from the cesspool at the gas works, where the ammonia water goes from the top of the tar well to the bottom of the cesspool, 10 feet below the surface, where it passes off through the ground. The ice man thinks the water in his well is made impure by the ammonia water passing through the ground and into his well.

Mr. Gregory further states that the cesspool has been in existence for about four years, and desires to know how far impure water will travel through gravel without practical purification. Have any of the members of the Association had a similar experience? While this is given as an experience, it is really a question, and might well have been placed in the "Question Box."

The next experience we have is from Mr. Hurley, of Tacoma, and relates to Welsbach lamps. Mr. Hurley gives the number of Welsbach lamps in use at his works, and the cost of mantles and chimneys for one month. The report is quite complete, giving names and places where lamps are used, with cost itemized for each place, which statement, of course, would be too long to introduce here. I find, however, that the average number of lamps is 672, and the cost to maintain averages 5⅝ cents per month for each lamp.

This concludes the "Experiences," so far as they have come to my knowledge. If any that are given have interested you, no doubt this department will grow in importance; but I am of the opinion that the members of the Association prefer to give in person the experiences which are called out by the many valuable papers that are read. They seem to be inspired, while the meeting is in progress, to get up on the floor, like good Methodists, and tell what they know about the Lord gas, the devil tar, and other imps of the business in which they are engaged. Praising the one and condemning the other.

If my efforts have in any way contributed to your entertainment—if, as individuals or as an Association, you can see any value in the "Department of Experiences," then indeed am I repaid for your kind attention.

On motion of Mr. T. R. Parker, duly seconded, a vote of thanks was unanimously passed to Mr. Clements for his entertainment of the Association through the recital of the "Experiences" collected; and on motion of Mr. George Thompson, a vote of thanks was unanimously given to Editor Parker for his statements regarding "Wrinkles."

QUESTION BOX.

The President—Gentlemen, we have a very long list of questions in our "Question Box." A relationship exists between a number of them: that is, Question 1 and Question 20 bear a close relationship, and so on; and, if you please, I will call these questions up in the order in which they have been laid out. I hope there will be a full discussion of our Question Box, because very often a question will bring out valuable data which a paper might not. Question No. 1 is:

> "Why should loss of gas by leakage and condensation be so much greater during summer than winter; temperature at station meter kept about the same?" Question No. 20 is, "To what extent does leakage vary in cubic feet between winter and summer?"

We can consider those two questions together.

The Secretary—From my experience I would state that there is no appreciable difference in our works between the leakage in cubic feet; it remains about constant. Its percentage, of course, varies with the delivery; and I think that is what the questioner meant to ask.

Mr. W. S. Wharton—I am the one who asked that question; and what I meant by it was this: At our gas plant I find that the actual loss in number of feet is trebled in summer over winter. For instance, to give you an idea: Our leakage may run down as low as 20,000 cubic feet or even 16,000 cubic feet during the month of January, with an output of 500,000, and during the month of July with an output of 250,000, or even less, it will run up to 70,000. I have constantly repaired meters, taken the meters in and examined them; also closed the leaks in the street mains, stopping all leaks that could be found in them by probing. I searched into the matter very thoroughly to determine if any local causes existed for the excessive leakage during summer time. I can readily understand that there would be a greater percentage of leakage in the summer than in the winter, by reason of the temperature of the gas in the holder being at a higher degree. Possibly, the gas being thinner, the same openings in the main would let more gas through than in the winter, when it is cooler; but I did not think there would be that difference.

The President—I think the attenuation of the gas due to higher temperature would offset that, so that the leakage through a given opening might be more; but I think the expanded condition of the gas would exactly offset it.

Mr. Gregory—Yes; I think the expanded condition of the gas, when put into your meter, then sent out from there in the summer to be cooled in the main would make a greater leakage. There would be a loss of gas before it got to the meters, and consequently it would figure as leakage; while in the winter time the expansion would be about the same, for it would be contracted before it was metered. Your gas would leave the condenser and scrubber in a cooled condition, pass through the meter in the same volume that it would remain in the meter, and be measured out by the meters to the consumers.

The President—Do you take your statement of the gasholders at 6 o'clock in the evening?

Mr. Wharton—I take the statement of the gasholder in the mornings.

The President—I think that is a better plan; to take the statement uniformly at 6 A.M.

Mr. Wharton—I have put a large sprinkler over the top of my holder, a shower of water coming down that keeps the holder cool during the hot sun, and I have noticed—although my holder is small, holding about 40,000 feet of gas—that if I have my holder filled on a real hot day the expansion by heat would probably make a variation in the holder of about 1,300 feet; that is, the raising of the holder would indicate an expansion of about 1,300 feet. That is the reason I tried the experiment of a sprinkler. I have not noticed any variation, however, in the leakage on account of that.

Mr. Clements—My experience is identical with that of Mr. Wharton. Our holder on a hot day will expand in height from five to nine in.

1. The drawing was not forwarded.—Eds. A. G. L. J.

ches over what it will do on a cold day. I didn't know anyone else had thought of it, but we also have a shower running on the top of the crown of our holder to keep down that expansion, and we find the same difficulty that you do, Mr. Wharton. We seem to make a material loss during the summer season. Although we are bothered very little with condensation, we find more difficulty in the summer time than the winter; it is a strange thing, but it is the case. We are called upon to look after the gas in houses oftener in the early part of the summer than we are in midwinter.

The President—If there is no other discussion we will pass to the next question, which is: Question No. 2--

"What pressure gives best results in gas cooking stoves?"

In answering this question I think the size of the pipe to the stove should be taken into consideration, because pressure and volume must be considered together.

Mr. Frank Foveaux—I think a 2-inch pressure is all that is necessary for gas stoves.

The President—Two inches, with the necessary size of pipe.

Mr. Foveaux—Yes, sir.

Mr. Parker—We find 1½ inch does very well. It gives good flame and satisfaction.

The Secretary—In Oakland we maintain 1½ inch pressure and use three-quarter pipe for ordinary service, with one inch for water backs. We take a direct connection from the service in most cases, the kitchen drop usually not being sufficient, so we run back to the kitchen. Where it is one-half inch drop, in a new house and good pressure, we use that.

The President—Question No. 3 is:

"When a city orders a change of grade to be made and street mains are required to be relaid, what account on the company's ledger should such an expenditure be charged to?"

Mr. C. F. Adams—Main repairs.

Mr. Clements—I think that would be right, unless you charge it to the city.

Mr. Wharton—That is naturally expense account.

Mr. J. B. Crockett—That is done in San Francisco; the city pays for every change of grade.

Mr. Wharton—In our locality considerable changes were made in the grades of the streets, occasioned by some oversight possibly of the former engineer, or in laying out the original town site. The city has regraded streets and we have been called upon to lower our mains—in many cases the mains were exposed completely, and some of our Directors have maintained that that should be charged up to permanent improvement. I have always maintained that it was an expense; you are not adding to the value of the plant by means of it.

The President—Questions Nos. 4 and 18 bear relationship. No. 4 is:

"Can a prepayment meter be changed to accommodate different rates per 1,000 charged for gas?"

Mr. Crockett—That question could be answered very readily by showing a prepayment meter. A prepayment meter was made in London for the San Francisco Company, which permits the charging of different rates. (Explaining by means of a meter.) If you want to reduce the rates change the pointer.

The President—That meter is made for 2-bit pieces (25 cents), and it is extremely difficult to set a meter where the rate of gas is $1.75 per 1,000, so that you will give the consumer exactly the right number of feet for "2 bits."

Mr. C. E. Burrows—Suppose they don't consume the 25 cents' worth at one sitting?

The President—It is held to their credit by that credit hand.

Mr. Clements—What is the expense of a meter of that kind.

Mr. Crockett—$11.25, paying duties and freight.

The President—Question No. 18 is:

"What has been the experience with the use of prepayment meters?"

I will state that the experience in San Francisco has not been very favorable to them. We had 20 meters in use some time ago. They were gradually taken out, until, at the present time, I think we have only two in use. The trouble that we have had is that they have been about 5 or 10 per cent. slow in registration, and I understand that, on the other side of the water, where they are using them extensively, the gas company calculates to charge a little more per 1,000 feet to pay this difference. They are against the company so that the company is constantly losing 2 per cent.

Mr. C. O. G. Miller—Can't you regulate the meter?

The President—It is impossible to do it, because you have two mechanical operations; one is measuring the gas, and the other is measuring the coin.

Mr. Miller—Couldn't that be obviated by changing the counter?

The President—They have not obviated it yet. It is almost impossible to unite two mechanical appliances, so that one will work with the other.

Mr. Miller—I thought, perhaps, it could be equalized. For instance, if you are charging $1.75, move your pointer up to $1.85.

The President—That could be done by experiment, but I doubt if it would be accurate. Mr. Cowan, of London, who was on a visit here some two or three weeks ago, said the London Companies preferred to have the meters run about 2 per cent. against the Company.

Mr. Crockett—I beg pardon; I hardly think that was it. Mr. Cowan said there was hardly any meter but ran 2 per cent. fast or 2 per cent. slow. His experience was that they ran a little slow, but never more than 2 per cent., and, therefore, that being a satisfactory percentage, they had allowed them to go at that. When I was in London I found they were using these meters to a very large extent, and all the meter manufacturers had gone into the business. They were putting them out as fast as they could manufacture them; in fact, they are almost superseding other meters. It has been taken up in this country, but to what extent I don't know.

Mr. D. J. Collins—I can only speak in reference to what our Company is doing in its own works. The satisfaction with them has not been very great. We are using very few prepayment meters, and I know one meter manufacturer who is not making any particular specialty of prepayment meters, because those that have been put out have not given satisfaction.

Mr. Crockett—We only bought 75 or 100 of them for a trial, and I don't think they have given them really a fair trial. I don't like to see the meter condemned on the evidence we have given here to-day, from the fact that at the time we received these meters we were all very busy building the new works, and we have not had the time to experiment with these. When they began to come back to us we allowed them to stay here without giving them a fair trial. I think by a fair trial we might do better with them than we have done.

Mr. Parker—What make of meter do you refer to from Philadelphia?

Mr. Collins—We have been using meters made by Messrs. D. McDonald & Company, and some of the others also.

Mr. Parker—Those of J. J. Griffin?

Mr. Collins—No.

Mr. Parker—Regarding the meter shown here, there is no resemblance between it and the Griffin meter. The Griffin meter is worked after the manner that the index arm is worked on a dry meter. That is connected with a slot arm, and, as the screw gets back, it just gradually shuts off the gas, giving a person three or five minutes' notice before the gas is shut off. As far as the prepayment meters are concerned in Napa, we can get hold of a class of consumers that we cannot reach in any other way. There are a number of people who do not like a bill of $2 or $4 presented at the end of the month. Five cents at a time doesn't bother. They meet with a great deal of favor there. We have set as few as we can on account of the expense of the meter. We pay $10.50 for them in Philadelphia. We have about 30 in use at the present time. With gas stoves it works very nicely, because it determines at once the actual cost of cooking a meal.

The President—Question No. 5 is:

"Is there a bye-pass made for street lamps that will not blow out?"

Mr. Parker—Taking the ordinary winds, such as we are subjected to, we have never had a burner blown out, but when the north wind blows every one of the bye passes blow out. I allude, of course, to the lamps using the Welsbach lights.

Mr. Wharton—I find that the pilot lighter is much more efficient than the ordinary lighter, but I have never found anything yet that will stand a reasonably hard wind.

The President—Questions Nos. 6 and 10 may be considered together. Question No. 6 is:

"What is the smallest annual sendout that would be considered profitable on this Coast, to change from a coal gas to a water gas system?"

Mr. F. H. Eichbaum—Question No. 6, I think, could best be answered by giving some experiences. A short time ago I saw a generator that had been shut down 24 hours, which in 10 minutes was ready to make gas again. We have often kept a generator alive for two or three weeks without opening it or giving it any more air than would pass through a knife blade opening of the lightest kind—it shouldn't be more than

No. 24 thickness. With an apparatus of that kind you can lie idle for two days or a week at a time; it is just a question whether your holder capacity is sufficient to permit you to shut down. Having holder capacity sufficient to hold the gas through one or two or three days will enable a company to successfully operate a water gas plant.

The President—Mr. Collins, will you answer question No. 10, which is:

"Assuming a Springer set to be 9 feet in diameter and 26 feet high, what advantage will accrue by raising shell 5 feet, adding that much to superheater?"

Mr. Collins—I should think Mr. Jones can answer that better than I can. I think, however, it would increase the efficiency of the apparatus somewhat. You have had considerable experience with this Springer apparatus.

The President—Answering that question, assuming that the old generator and superheater is 26 feet high, an addition of 5 feet would certainly increase and add to the efficiency.

The Secretary—How much do you think it would add to it?

Mr. Crockett—Mr. Brown, of Minneapolis, told me not very long ago that, by raising his superheater 10 feet, he could save half a gallon of oil.

The Secretary—I have commenced the work of raising the superheater 5 feet. It was simply an experiment with me. It is going to cost only about $200 to do the work. If it will save us even one-fourth of a gallon of oil per 1,000 it is money well spent.

Mr. Collins—I don't think you will save that much oil in raising the superheater 5 feet. On that theory you could keep on moving it up indefinitely until you would not use any oil.

The President—Questions Nos. 7 and 12 can be considered at the same time. Question No. 7 is:

"Will some member explain why it is that, in a service pipe taking its supply from a main that is covered underground, gas will freeze more readily if service is exposed to severe cold, than a service taken from a main where neither main nor service is protected?"

Mr. Collins—Isn't that all owing to the temperature; using a street main that is well covered?

The President—I think so. A gas charged with aqueous vapor will retain that vapor when passing through warm ground or cold ground, but on sudden change it may assume the form of hoar frost.

Mr. Wharton—We have that experience up on the Sound occasionally. To explain it: At our gas plant we have a number of services which cannot be protected without considerable extra expense. We have about 2,000, probably 3,000 feet, of main which goes over a bridgeway entirely exposed. In that locality, even if it should be zero weather, we never have any trouble.

The President—My experience has been the same. In Boston, where we have frost very early in the fall, and continuous throughout the winter, sometimes going down into the ground for 6 or 7 feet, we have less trouble with gas mains laid in the frost than mains that are laid between the wind and water, as you might say, where the frost first takes hold, and then lets go; so, in frost countries, I think it is better to lay them shallow.

Mr. Foveaux—Isn't that due to the volume of gas passing through the main?

The President—The rapidity of the flow?

Mr. Foveaux—Yes; the pipe being so much larger has not the tendency of freezing where a small service will more easily freeze.

The President—Question No. 14 is:

"Has any gas burner been found in use in show windows that will not sweat the glass in cold weather?"

Mr. Clements—In regard to this question I would like to say that a coal oil lamp will do that same work—the windows will sweat from a coal oil lamp.

The President—The amount of sweat that would be produced is dependent upon the chemical condition of the gas that is burned,

Mr. Clements—It may do more than a lamp would, but a lamp will do it.

The President—Any substance burned that produces water will sweat a window; that is, with the conditions of temperature right—cold outside and warm inside.

Mr. Burrows—My observation is that the sweating of the window is largely dependent on the ventilation. In many places some show windows would show sweat and some would not.

The President—The eve of Thanksgiving or of Christmas, in Eastern cities, where the store dealers are anxious not to have their windows frozen, they put a row of candles inside to form a current of air upward to partly heat the glass and carry away the moisture from the window. Question No. 16 is:

"Do you find the use of cannel coal as an enricher forms naphthaline in any greater quantities in pipes through the works?"

Mr. Burrows—I am using cannel coal as an enricher, and have never had naphthaline in my works.

The President—Question No. 8 is:

"Has any member succeeded in getting a rebate from the Welsbach Company for mantles breaking in first starting?"

Mr. Ph. Meyer—I sold 17,610 lights since we met last year. I have used about the same number of mantles for renewal and some extra, so that I think I have sold about 30,000 mantles in all, and I have so far not succeeded in obtaining a rebate from the Welsbach Light Company on the account noted. I send in my claims but never get an answer.

Mr. Wharton—It is past the hour set for the end of the discussion, but there seems to be a disposition to go ahead with these questions. One question in connection with the Welsbach light is of interest to me, and I think it is of interest to every gas works represented here. I can speak for myself, and for the Tacoma Gas Company. If you will allow me a few moments I will explain myself. I would like to state in the beginning that I am a great friend of the Welsbach light, for I think it is the only light that has ever come to the gas people that has enabled us to cope with electricity, and I think the efficiency of the light is marvelous. At our plant we have pushed it for all it is worth. I believe I have had as much personal experience with Welsbach burners as any man in the room, unless it be Mr. Meyer. I know I have in point of time. At our gas plant I devoted especial attention to the Welsbach light and its maintenance, and my experience has been very sorrowful in regard to the keeping up of the mantles. Since 1891 I have been working with this burner, and have in use about 1,100. A year ago I found I was losing customers on account of breakages. Up to that time I followed the plan of going around and seeing whether or not a mantle was in good order. If a mantle was found in bad order I would ask to have it renewed at the cost of the consumer. I found that the consumer would naturally hold on to it as long as it gave any light at all. By and by the mantles would break and become an unseemly sight, and it was a bad advertisement. I adopted the plan of supplying the mantle renewals at a given rate per month, and I put it down as low as possible; in fact, too low. I agreed to renew mantles and chimneys provided the consumer would start them in good order, at 10 cents a month, going around twice a week, renewing those that needed renewing, and also cleaning the chimneys. I kept a very accurate account of my experience, and in 1,800 which I had under that kind of contract I lost $117. That we charged up to "experience," and as long as we had maintained our lights in a creditable shape we thought it was worth that to us. I made such statements as that to the Welsbach people, gave them my experience and asked for a rebate. They always refused. Frequently I have received broken mantles, although outwardly the packages would seem to be in good order, I would report that to the Company, but they would give no concession. What I wish to bring before the Association particularly is to see if we can not unite in some kind of a resolution to be sent to the Company with regard to guaranteeing mantles or to making good broken mantles. At the Seattle gas plant last winter a gentleman who had four months' experience at the Welsbach home plant, came out to instal the burners. I found him a very expert gentleman. I offered my services for two weeks to go around with him to catch on to anything new that he might have in putting them up. During the two weeks we together put up 300 mantles (renewals), and out of that number we lost 11 per cent. in starting. He said that in Philadelphia, where there is only a short transportation, they reckon on 10 per cent. breakage. In Tacoma and Seattle and at our plant we have been working this burner and have lost money in maintaining it. They have had such experience in renewing mantles that they are going back to electric lights, particularly the arc light, and we want some concession from the Welsbach people if it can be had. Individually we cannot get it. I would like to have this Association take it up and see if our action will not be an opening wedge for other Associations to take hold of. They recognize that when they put the thing in the hands of a gas man they put it in the hands of their friends. Gas companies have pride in keeping the burner in good condition, and if the burner breaks in starting they renew it—anything to keep the consumer quieted. I say the Welsbach Company are standing in their own light when they don't grant us some conces-

sion. I believe that the future of the gas company is in the Welsbach light.

Mr. Burrows—I thought at one time I would say something about the Welsbach light—I didn't have time to prepare a paper; but my experience does not coincide with that of the gentleman who has just taken his seat. We have put out between 800 and 900 Welsbachs in our town since a year last March, and our breakage of mantles certainly does not exceed 1 per cent.—I mean when first applied; and in many instances I find that a mantle, broken at the bottom where it comes down over the cylinder, can be used for a considerable time after that. A mantle that shows that much break I don't renew. I think myself that the Welsbach Commercial Company are very arbitrary, and possibly some action by this Society might lead them to consider it to their interest to make some change in their methods of doing business. I never asked them for a rebate, but my correspondence with them shows them to be very independent. My experience with the Welsbach light, putting the total expense of mantles against the saving under the open flame burner, has been such that I have not any fear of my customers going back to any other light; in fact, I have endeavored to hold back the Welsbach in the interest of our electric plant, but notwithstanding that we have lost nearly all our commercial arc light lamps and a few of our incandescent lights. I took 12 consumers, using 96 Welsbachs in certain months of 1895, compared with open flame burners as used in the corresponding months of 1894, and I found 44 per cent. saving, including the cost of mantles and chimneys. In fact I found that the cost is considerably less than the cost of coal oil, with gas selling at $3 per 1,000 in our place. The use of the Welsbach altogether, taking both our systems of lighting, electric and gas, has reduced the total income to some extent, but it has increased the sale of gas to a large extent, so that we consider we are ahead by using Welsbach burners. For instance, the effect on the gross business for four months was 13.77 for gas, and a decrease of 16.4 for electric light. For the months recorded, the decrease in receipts for gas and electric business was a fraction over 5 per cent. That is not exactly what we want, but it was better than to have them go from electric light to coal oil, which many of our people had done. Since that we have replaced all the coal oil lamps on our business streets with Welsbach lamps.

Mr. Wharton—One year's experience is not sufficient. A customer will stick to the Welsbach lamp and suffer breakages for possibly a year, but he will not go on that way for two or three years. My experience goes to show they will not keep it up. There is no question about the saving in gas. I have taken out arc lights and put in Welsbach lights at half the cost, but, nevertheless, the consumer later on threw out the Welsbach light on account of the nuisance in breaking. It is not the dollars and cents. You cannot fail having a serious breakage, and the only way in my opinion to keep peace with your consumer is to constantly watch the lights for him and make his renewals. If you wait for him to do it, you wait until most of your lamps are broken, then you lose him and you never get him back—he won't go back to the plain tip, and you have lost him permanently.

Mr. M. C. Osborn—I have had some experience with the Welsbach. I think the chimney is most to blame. When the chimney cracks it curls the mantle and when the operator goes to put on a new chimney he breaks the mantle. When the Welsbach Company gets out a chimney that will not break it will help the efficiency of the burner a great deal. The main part of the trouble is through the chimneys breaking by reason of the variation of temperature.

Mr. Meyer--May I say a few words more about the Welsbach burner? Taking the Welsbach in all there is nothing like it. Three years ago I said the same thing. There is no better or cheaper lighting agent than the Welsbach lamp of to-day, but I think the Company could improve its methods of placing the burners. As to the losses of mantles. If the Company would only give us a mantle which we had some years ago, and which they have lately supplied, the loss would be actually nothing. My men (I have six in the office) do nothing but repair and replace lights. On the old mantle the loss was only two per cent. But the Company has been supplying a nickel support with a small loop. It is the same mantle that is placed on the iron support, and owing to the difficulties connected with transportation to this Coast do not have the necessary hold in the cube; they lean over. The dropping or rough handling of the box causes them to tilt over, and they burn off right where they are attached to the loop. Lately, they have inserted a pasteboard with a slip in it, which holds them tighter and to some extent overcomes the tilting. The loss is not quite as heavy as before, yet with the iron support, which we had on this Coast before September, 1895, I did not have any difficulty; in fact, there was nothing whatever to complain about. In some consignments of this nickel supported mantle the loss by breakage in transit has often been as high as 25 per cent., and I do not think we should stand that loss. The present mantle of itself is a very superior mantle and the lamp is a far superior lamp to any of the old style. I don't think the Company intend to do anything wrong, but they have at various times sent us something of which they were not quite sure; and I don't think it is right the Company should make us stand the faults of their experiments.

X RAY DEMONSTRATION AND AN EXHIBITION OF ACETYLENE GAS.

On motion of Mr. Miller, the further consideration of the Question Box was postponed in order that the exhibition of the Roentgen system of photographing might be proceeded with, following which was a demonstration of the illuminating power of acetylene gas. The illustrator was Mr. J. B. Grimwood, of San Francisco.

The President, in introducing Mr. Grimwood, said: In showing the X Rays and acetylene gas no set papers have been prepared. Mr. Grimwood is to show you the Crookes' tube, and with it he will take a photograph of some object that may be selected. I will try to have prints made from the negative, if it proves to be a good one, and later on shall send copies to the members at their homes. I think it would be better if this were done informally, so that we may gather around the table and discuss it, and ask questions, so we will consider this an informal session until we re-convene.

Mr. J. B. Grimwood then gave an exhibition of the Roentgen ray, photographing the emblem of the Association through one of the souvenir books. Then followed an exhibition of acetylene gas, after which the President called the convention to order.

Back to the Question Box.

The President—Question No. 15 is:

> "Is acetylene gas any more poisonous than coal gas, or any more liable to explosion?"

The last part of that question may be answered in this way: Acetylene gas is most explosive when mixed with 12 parts of air, and water gas when mixed with 7 parts of air; so that the proportion is as 12 to 7. Quoting from a paper written by Dr. Rudolph Rosemann, from the *Journal* of the Pharmacological Institute of the University of Griefswald, and reprinted in the Progressive Age of March 1st, 1896: "Acetylene, present to the amount of 1 per cent. by volume in the atmosphere, causes deep narcosis. Asphyxia symptoms are always observed, the action of the heart loses intensity, the pupils become enlarged, and breathing becomes irregular. Restoration is made possible by admission of fresh air, and reaction of the acetylene on the blood does not take place. The blood saturated with acetylene shows exactly the same lines of absorption as oxy hæmoglobin, but the size and position of the lines were different from those of the carbon monoxide; but it is most likely that, as is assumed by Hermann, acetylene gas does not combine at all with the blood, but acts like an indifferent gas toward the blood." Dr. Rosemann tried a number of experiments on animals, with results as follows: First experiment.—A young cat was caused to breathe an atmosphere containing 20 per cent. of pure acetylene for three quarters of an hour and without apparent injury. A white rabbit breathed an atmosphere containing 21½ per cent. of crude acetylene for 1¼ hours, remaining perfectly well, without any noticeable changes. Two cats were caused to breathe air containing 22 per cent. of acetylene gas, and in all breathed 75 liters of acetylene; and under these conditions it required seven hours before the animals died. Any difference between the effects of purified and crude acetylene could not be noticed. The contents of the Question Box have been exhausted.

Additional Elections to Membership.

The Secretary—There have been received four applications for membership, handed in too late for action at the regular time. I would like some member to move a suspension of the rules.

On motion of Mr. D. J. Collins the rules were suspended, and the Secretary read the names of the following applicants for membership: Frank Foveaux, of San Francisco; R. E. Hooker, of Port Townsend; D. E. Martin, of Oakland; and A. T. Eastland, of Stockton. On motion of Mr. J. B. Crockett, duly seconded, the Secretary was instructed to cast the ballot of the Association for the named gentlemen. The Secretary subsequently announced that he had so cast the ballot for the gentlemen named, and the President declared them duly elected as members.

Report of Committee on President's Address.

The Secretary then read the report of the Committee on President's Address, as follows:

"Your committee, appointed to consider the address of the President, would respectfully report that they can add nothing to strengthen the argument made by Mr. Jones for the appointment of committees on 'Uniformity of Accounts,' and the 'Adoption of Standard Castings, Weights and Measures.'

"We recommend the appointment of such committees, with the suggestion that the Committee on Uniformity of Accounts should report at its very earliest convenience, in order that such companies, whose fiscal year begins January 1st, should at that time avail themselves of the suggested system.

T. R. PARKER,
JOHN L. HOWARD,
M. C. OSBORNE,
} Committee."

On motion of Mr. D. J. Collins, duly seconded, the report of the committee was adopted.

The President appointed as a Committee on Uniformity of Accounts, Mr. John A. Britton, Mr. C. O. G. Miller and Mr. C. F. Adams.

The President—It becomes necessary that we appoint a Committee on "Wrinkles" and "Experiences" for the ensuing year. Our worthy head of the department of Wrinkles has been elected President of the Association, so it will be necessary to make some change.

Mr. Crockett—I would like to nominate Mr. Clements, of Red Bluff.

Mr. Eichbaum—I see no reason why Mr. Parker should not be continued. I think the Association would feel under obligation to him if he would continue to act, if not as chairman at all events as a member.

Mr. Parker—I would like to enjoy all the privileges of the President, and don't wish to deprive any member of the pleasure of collecting "Wrinkles." It indicates a sort of freemasonry among gas men, and I take occasion to thank Mr. Crockett for placing me there.

The Secretary—I would like to place in nomination Mr. Osborne. I think Mr. Clements would do better with "Experiences," as he has inaugurated that. It was taken up very late in the season, and I don't think he had a chance to show what might be done with that department. We want someone who can write letters as Mr. Parker did. I figure that, to secure the 12 Wrinkles obtained this year, he has written so many letters that, if the words were placed side by side, they would reach around the world five times. He is the most indefatigable letter writer in the Association, and I am sorry to lose him.

Mr. Clements—I thank you, gentlemen, very kindly for mentioning me in that connection, but I am not fitted to occupy that position. Mr. Parker has done all the work. I am willing to do anything for the Association, but I am certainly not the person for the Wrinkle Department.

The President—Suppose we combine Mr. Osborne and Mr. Clements in this work, putting Mr. Osborne at the head of the Wrinkle Department and Mr. Clements at the head of the Experience Department, each to assist the other.

Mr. Parker—I would suggest that Mr. Osborne and Mr. Clements could segregate them and pass to each other. It is a pretty hard matter to have two kings in one kingdom, so that if each one could have his individual line to explore, and as I say, separate according to his judgment, and pass from one to the other, I think they would meet with a great deal better satisfaction.

It was moved and seconded that nominations be closed. Motion seconded and duly carried.

On motion dulv made and seconded, the Secretary was instructed to cast the ballot of the Association for Messrs. Osborne and Clements, as members of the Wrinkle Department, which he did, and so announced.

FIBER PIPE.

Mr. Eichbaum—There are on the table there some specimens of fiber pipe, which look very well indeed. I would like to know if any member knows anything about its tensile strength and its capacity to bear up under pressure. It is not enough to look at pipe. What we want to know is the amount of strength it has to withstand the various pressures to which pipes are exposed. I, myself, know nothing about it, except what I have seen in their circulars.

The President—Can any member answer Mr. Eichbaum's question? I have tested the pipe chemically for its ability to resist the effects of different substances, and it withstands them. It is said to be proof against the electric current up to 10,000 volts, but it seems to me that it lacks the test of time. I have been unable to find anybody who has given it the test of time. I would like very much to hear from some gentleman who has laid the pipe.

Mr. Burrows—I have been waiting for this question to come up, for I am somewhat interested. I have not given it a test so far as actual use is concerned, but last fall I got two lengths of the pipe and put it in the ground, in a formation largely of lime and sand, chosen because of the different materials in the ground, and passed gas through it during the winter. After it had been underground three or four months I took it up and found that it had been affected neither by the gas nor the ground. I know nothing about its strength except what the circulars stated. I am interested in finding out if it is a good pipe.

Mr. L. P. St. Clair—I had a sample of that sent to me last year. The man who put up my water gas plant had put up a water gas plant for a company in New York State that had tried that kind of pipe. He gave the name of the company and I wrote the latter in regard to it, asking what was their experience with it. They answered stating they had it in use some two or three years and had no reason to regret doing so. In fact, they thought it was the correct thing to do, and they were continuing to put it down.

Mr. Clements—Some twenty-odd years ago I laid a 4-inch main of the length of seven blocks, in a pipe made from pine logs. At the end of 20 years we had very little trouble with it, and it seemed as sound almost as the day we put it in. It was water pipe. From that experience it seems to me that this wood fiber will be a good material for our purpose.

Mr. Parker—Speaking about wooden pipe. In the town of Oroville, about 25 miles above Marysville, gas works were built 35 years ago—I don't know by whom; but the mains were bored logs driven together, and when inspected some years after we found them just as good as the day they were laid. The little works were a curiosity. The purifiers were made like an inverted pyramid, the inlet going in at the peak of the pyramid, and the pyramid having steps to it. I don't know whether that wooden pipe is still in the ground or not.

Mr. Burrows—Assuming that the pipe is (of course we can't prove it) as durable as cast iron pipe, the question I would like to have answered concerns the relative cost of putting it in the ground; taking 4-inch pipe, for instance, the fittings and labor involved and the cost of the pipe—which is the cheaper?

Mr. St. Clair—I happen to be in a position to answer that question. I have figures made to me for a carload of 6-inch pipe to be landed at my place for 42 cents per foot.

The President—What does 6-inch cast iron pipe cost?

Mr. St. Clair—About 60 cents per foot.

The President—From figures I have made, I have been under the impression that the pipe would cost about a third less than cast iron, laid in the ground. I would not like to give any figures from guesswork. In considering this matter, most of our pipe comes by sea freight, and I think most of this fiber pipe has been brought overland, so it is not a fair comparison.

Mr. Burrows—The cost of cast iron pipe in our inland towns is absolutely prohibitory. We have never laid any. We have to pay freight to the coast, and then local freight back. I don't know how it is through California.

Mr. St. Clair—It is the same.

Mr. Burrows—That makes it prohibitive. We have always used wrought iron pipe on account of the first cost. The pipe we have has been in the ground 10 or 15 years, and it is becoming so defective that we must now relay a portion of it. This fiber pipe can be bought, as near as I can figure it, so we can put it in the ground for 50 or 60 cents a foot. Of course, I don't know the cost of fittings.

Mr. St. Clair—The fittings are in proportion.

The Secretary—I bought 100 feet of that pipe, and have not had an opportunity to lay any of it yet. A number of the couplings and two or three lengths of the pipe arrived broken. It seems to me to be very brittle. I imagine it will break very readily, and it won't stand abrasion; you can't use the ordinary tongs. Twenty-eight cents was what I paid per foot, and the freight was about 22 cents, making 50 cents for that small lot. I can buy 6-inch cast iron pipe for 35 or 40 cents. I suppose, however, around the Horn that pipe would be cheaper. I am going to lay the 100 feet right away, or as much of it as has not been destroyed, and hope next year to have some experience to give you on that point.

Mr. Eichbaum—Mr. Britton touches the point, I think. I am satisfied from inspection of those samples that it would be very easily broken between couplings. And another thing, in order to lay it properly you want to be provided with a means of cutting those threads.

The Secretary—They furnish sleeves.

Mr. Eichbaum—I am afraid, if the bedding is not perfect, it will break between the joints.

The Secretary—In my opinion the mere touch of a pick would break it. I am going to try it in a suburban portion of the city, where it won't be liable to disturbance.

Mr. Clements—When you make that experiment, wouldn't it be well to see how it works under tap?

The Secretary—They don't admit that you can tap it. They make special sleeves of special sizes.

Mr. Burrows—You can tap it by putting on a strap.

The President—Another question that has been handed in is:

"Has anyone had experience with the use of forced draft under open settings retorts?"

The Secretary—I will state that I have had. On receipt of a letter from one of our number asking that question, I took occasion to experiment. I found that it gave an uneven heat all over the bench. The ashes were blown up over the setting, and the heats went down. I tried it four days and then gave it up. I didn't save any fuel, but it caused discomfort and inconvenience. The unevenness of the heat is what puzzled me. It was noticeable to the eye.

Mr. Charles F. Adams—Several months ago I saw something in the American Gas Light Journal on that subject, by Mr. Yorke, who wrote me a letter on the matter. My experience with the plan was similar to that of Mr. Britton, and I made up my mind it must be done in some other manner.

The President—One more question is at hand:

"Is it better for a gas company to employ a solicitor on a fixed salary or on a commission?"

The Secretary—I would employ him on a fixed salary every time; he will do more honest work.

Votes of Thanks.

On motion of Mr. Clements, duly seconded, and put by the Secretary, a vote of thanks was extended to the President of the Association for his very kind attention during this session, the resolution being carried by unanimous standing vote. A similar vote of thanks was given to the Secretary.

Mr. T. R. Parker, at this point, in a few suitable remarks, presented to Mr. Jones, the President of the Association, a handsome album[1] containing the photographs of the members of the Association. Mr. Jones, on accepting the present, expressed his thanks for the souvenir and his appreciation of the fraternal spirit that caused the members to remember him so kindly.

On motion of Mr. Crockett, duly seconded, the convention then adjourned.

The Forfar Retort House Plant.

[A paper read by Mr. Forbes Waddell before the North British Association of Gas Managers.]

Last year a new bench was erected, consisting, as shown in the drawing, of four ovens—two for settings of six and two for eight retorts each on the regenerative principle. I, however, reduced one of the ovens, by building an inner arch, in the view of setting in it, in the meantime, only four retorts. On strong cast iron brackets, bolted to steel binders, are supported two hydraulic mains, one for the settings of six and the other for the settings of eight. Four dips, as shown, are provided with blind flanges. From the mouthpieces the gas is led through cast iron ascension bends, steel ascensions and cast iron bridge pipes, all 8-inch bore; and thence through cast iron dips, the internal diameter of which is 8 inches, to 7 inches above and 7 inches below the cover of the hydraulic mains. The latter are entirely of steel plates, the covers and ends being 3-8th inch, and the sides and bottom 1-4th inch thick. That serving the settings of eight and four retorts is 22 feet 6 inches long and 22 inches wide.

The tar and liquor are drained off by separate pipes. That for the tar to a U-shaped wrought iron steam pipe, 2 inches in diameter, provided at one end with a cast iron flange 8 inches in diameter, and from 1 inch thick at the center to ¾ inch at the outside. That end is fixed to the bottom of the hydraulic by six ⅝-inch bolts, and the other is set to overflow at a level of ¾ inch above the dip mouths, and is sealed at the outlet by a second U-pipe. Gas pressure is communicated from the main to the overflow point by means of a ¾-inch steam tube. The U-pipe is 20 inches deep, and fixed 5 feet from the end of the main. The liquor is drained off by means of a 1-inch steam tube, screwed into the foul main at a distance of 6 feet from the tar pipe. Its upper end terminates at a level of 2 inches above the dip mouths. It is sealed in the manner shown, and led to a point where it is conveniently seen when liquor is flowing from it.

As the dimensions of the ascension, bridge and dip pipes and the principle of overflow are perhaps not the most usual, I now ask your indulgence while I, as briefly as possible, give you my bases of design.

1. For a description of this album, see Journal, July 27, p. 122.

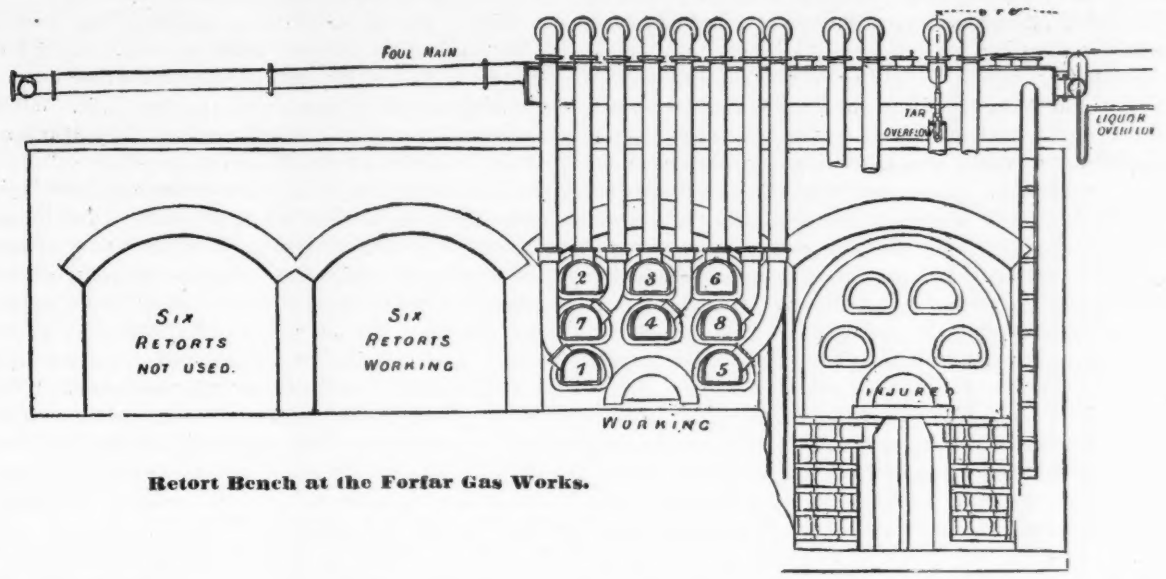
Ascension Pipes.—On a former occasion I had substituted an 8 inch for a 6 to 5-inch ascension pipe, and observed the following: (1) With usual heat, no liquid tar in 5-inch ascension pipe. (2) With usual heat, quantity of tar in 8-inch ascension pipe. The presence of this liquid tar in the 8-inch and absence of same in the 5-inch pipe depended, I argued, on the different rates of travel of the gas through the wide and narrow pipes; and in answer to my own question, "What becomes of liquid tar in the 5-inch pipe?" I thought it reasonable to say, "It goes to the hydraulic main." (3) With extra heat at the front of the bench, and therefore on the lower part of the ascension pipe, a quantity of what I am inclined to call tarricles—conical pieces of tar coke—was deposited in the lower end of the pipe and on the mouthpiece. Under these conditions, the make of gas per mouthpiece and per ton was largely increased, and it is only a fair deduction to make, I opine, that the tar which was deposited on the mouthpiece as a liquid with usual heat was converted by means of extra heat into gas and tar coke. Of the latter I obtained, under the most favorable conditions, as much as 7 lbs. from one charge. The quantity of gas resulting from this secondary carbonization is surely considerable; but the extent to which we may benefit by it is not, I am sure, anything like represented by the figure I have just given. I am satisfied that experiment in the direction of returning to the mouthpiece as much tar as possible, and, by means of heat at present wasted, carbonizing it in the vicinity of the mouthpiece will be well worth pursuing.

Much of the above may be considered somewhat of a digression. But it furnished me with a reason for ascension pipes being made large, and as I consider the following bear pre-eminently on my subject, I risk what you may call further trespass. From the water washed like appearance of the bridge pipes taken down from the setting of four retorts where the accident of Nov. 11 last occurred, from the presence at mouthpiece of tarricles, and from the fact that though making at times over 11,000 feet of gas per mouthpiece we have not had a choked pipe since the erection of the bench—from these facts, I say, it is reasonable to conclude that: (1) A liquor vapor is suspended in the bridge and its vicinity; (2) the tarricles at bottom would, under other conditions, go to the hydraulic main as pitchy tar; and (3) the liquor vapor is the means of keeping the hydraulic main free from pitching or pasting tars, and is therefore very desirable. It is, as far as I have been able to observe, due, on the one hand, to the gas temperature being lowered further by slower travel before it enters the hydraulic main, and, on the other, to a seal of liquor alone.

Overflows.—When designing the bench mountings, I wished to get the best possible means of draining off liquids, and did not specify, but asked each firm to furnish designs. These, however, disappointed me, as they were, without exception, that form which drains off both tar and liquor through one pipe fixed to the bottom of the main, and which I believe to be the most common form. The single overflow consists of a **U**-shaped tube of the same form, and fixed in the same way, as the pipe serving as our tar overflow, which is drawn here; and no doubt it has the virtue of being able to maintain a solely liquor seal. I had, however, previously adopted a modification of it which has given entire satisfaction to me, as it has to many. It is simply the addition of a second pipe, as described and drawn; and as it does not seem to be universally considered as safe as the single overflow method, I shall, in as practical a way as I can, endeavor to compare the merits and drawbacks of the two kinds.

I take it for granted that, for all practical purposes, the liquid products deposited in the hydraulic main are tar and liquor; and, further, that the characteristics of their behavior are: (1) they do not mix; and (2) tar is heavier than liquor, and sinks below it.

With the aid of this vessel [shown], which correctly represents the dimensions of the means of overflow adopted at Forfar, I hope to explain clearly how both methods do their work. Suppose this vessel to be a hydraulic main, in which tar and liquor are being deposited; and, further, let this **U**-shaped tube fixed to the bottom be, in the first place, the only means of outlet for the liquids mentioned. On the liquids being poured in, you first observe that there is quite a distinct dividing line between them—they do not mix. Secondly, though no difference of surface level is at first observed, it becomes evident, as the levels are raised by adding more liquid, that the liquor surface mounts higher and higher above that of the tar. Just now, for instance, it is seen that the distance from the dividing line or common surface is fully 11½ inches to the liquor level, while it is only 10 inches to that of the tar—a difference between the surface levels of quite 1½ inches, and when the tar surface reaches the level of the overflow point, the liquor level is, as you see, fully 3 inches higher. This overflow point is ¾-inch above the dip mouths, and therefore the depth of seal is now 3¾ inches.



Retort Bench at the Forfar Gas Works.

Single Method.—Up till now, you observe that nothing but tar has been drained off; the liquor following natural laws in floating on the top of the tar. I do not consider it advisable at present to go into the specific gravities of the two liquids from a nice point of view; but think our purpose is well served by observing that a column of tar 20 inches high is able to maintain one of liquor fully 3 inches above its own level, and that the difference of levels is proportionate to their height above common service.

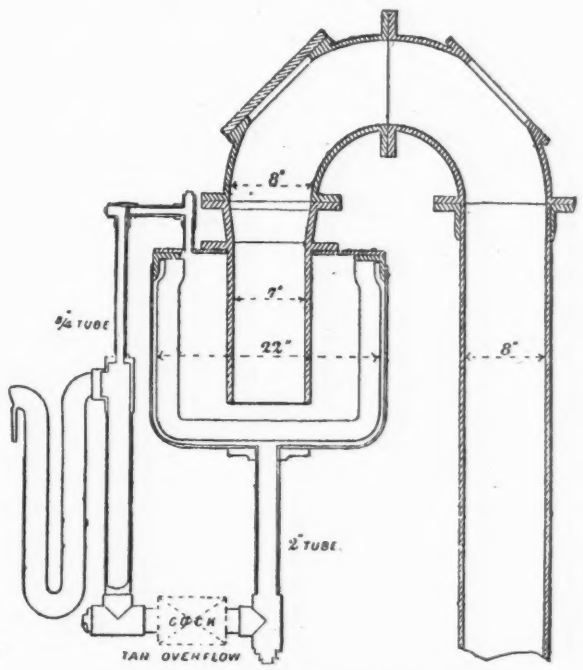
Now note that, as long as gas is being made, both liquids are being added to the contents of the main; and further note what happens with the single U-pipe method. The liquor level has a tendency to rise further; but you observe the tar is no longer equal to supporting it, and the result is the flushing out of all tar and the lowering of the liquor service inside to the same level as the overflow. The point I wish to make clear is this: With the single U-pipe overflow for both tar and liquor, the depth of seal varies from, say ¾ inch to 3¾ inches.

Two Separate Overflows.—Suppose, now, a start is again made with the same U-pipe, the liquids being added as before. It is observed that the behavior is exactly what it was in the first case—that is, the difference of surface level is gradually increasing. The tar is again being drained off and the liquor left. Now try the effect of a second overflow-pipe, as adopted by me. I trust it is sufficient for you to observe that, no matter how much of both liquids is added, they are now both being drained off constantly. The reason why the tar is not now flushed out is, I think, obvious—viz., the liquor is not allowed to get too heavy for the tar. What I trust that makes clear is that this second overflow-pipe is the means of preventing the flushing and varying depth attendant on the single method.

A Contingency.—Let us now imagine that, through accident, the overflow point is lowered ¾ inch. What happens? You observe the seal with the single U-pipe to vary in depth from 3¾ to ¾ inch. Surely our only deduction is that, after accident, the depth will vary from 3 inches to 0 inch—that is, the dips are unsealed. Apply the same to the separate over-flow method. The difference of surface levels being (as it is in our actual working) 1¾ inch, you observe, before the overflow point is lowered, that the depth of liquor in the inside arm of the U-pipe is fully 9 inches. Now lower the tar-overflow ¾ inch, and observe what happens. If the liquor pipe has not been lowered, then the difference of levels, which was at first 1¾ inch becomes 2 inches; but though the dividing line in the U-pipe is lowered about six inches, no liquor is yet flowing from the tar-pipe, and the seal is still full depth. Lower the tar-overflow still further, and the seal is still as deep. Finally, the difference of levels would require to go beyond 3 inches before any liquor finds a way out. This means that there is a margin allowing the tar-pipe to fall 1¾ inch at Forfar, and maintaining the seal. It is the fact of this second pipe preventing the liquor rising so high as to press out the tar, to which we are indebted for the safe seal under such circumstances; and I cannot but think it worthy of being called a safety-valve on that account.

Depth of Seal.—Anticipating a question as to the depth of seal and its pressure in the retorts, I may say we have, since we commenced to work the new bench, had the former 2 inches; and the two inches pressure consequent thereon has been reduced to 1 inch by maintaining a vacuum of 1 inch. Someone may say I could work, while the exhauster is in action, with a ¾-inch seal; and when it stops, the seal could be instantaneously increased by raising the liquor-overflow 2 inches and rushing in water. I presume you will admit that, with a 2-inch seal and a 1 inch of vacuum in a hydraulic main, where the area of the idle dips is only $\frac{1}{16}$th the area of the main outside dips, the stoppage of the exhauster practically means a seal of $1\frac{15}{16}$-inch, and a pressure corresponding. What does the other mean? The difference of level between the two overflows suddenly increased by 2 inches. In our case this would be equivalent to making the liquor overcome the tar, flushing out the main, and reducing, instead of increasing, the depth of seal.

It will be noticed from the drawings that I have no adjusting valve on either tar or liquor overflow; and I may say my reason for such an arrangement is got from previous experience. The following gives the



Hydraulic Main Attachments.

gist of it: Suppose one of your men raised the lip of such a valve, say, 2 inches at the liquor-pipe. The inevitable result in my case would be the gradual increase in difference of levels, the unsealing of dips, etc.

Our men have all along been required to give attention to the condition of the seal; and what I consider the safest plan is to listen to the bubbling noise made by gas in passing through the seal. To those who have, perhaps, not paid particular attention to this point, it will be interesting to learn that the noise from a 2-inch liquor seal is not at all loud; and with one of 1 inch deep, it is not to be heard from our retort-house floor. If the men hear it, then I consider it safe. But where the separate overflow method is used, there is a feature in this connection that should commend it to all—that is, if liquor flows from its respective pipe it is evidence that the seal is full depth; and if it is pure liquor, then the tar must be flowing from its overflow. If it is doing so, it cannot be pitchy or pasty.

Evidence Taken at Investigation.—The evidence taken at the inquiry was to the following effect: Setting of four retorts had first been in action. The overflow described was attached to the hydraulic main over that setting, which was injured. Setting of six adjoining eight next in use, and that of four retorts, with its hydraulic main, standing idle. Setting of eight retorts next started. On and before the day the accident happened, setting of eight and adjoining six working; the other setting had not been in use. Bench had then been in work over three months. Gas making often stopped to make temporary connection. Overflows had worked perfectly about three months. On the 11th of November no gas was made from 9 a. m. till we had made permanent connection to the purifiers. Before 7 p. m., water added to the hydraulic to compensate evaporation. Liquor at this time flowed from the liquor-pipe and tar from the tar-pipe. Gas making commenced before 7 p. m. Exhauster stopped at about 9.20 p. m. Back-pressure observed to be 5½ inches. All reported right by 10 p. m. Two retorts of setting of six drawn and charged by 10.10. One retort (No. 4) in setting of eight drawn and charged by 10.10 p. m. No heavy bubbling or gas coming back. Man on six wheeling out coke, and man on eight half finished drawing No. 5 retort, when noise is heard, and gas comes back. The manager, Mann and Grant entered the retort-house, when Stark is just finishing charge. All hear very loud gurgling and see gas coming back rapidly. Not a minute between gurgling and explosion. The doors of four retorts, already partly open, were previously opened wide. Flame issuing from broken bridge-pipes gradually falls, as two pailfuls of water are added. Bubbling now audible. Gas making goes on as before 10 o'clock, with bubbling heard from floor-level, without addition to seal. No sign of gas coming back. The hydraulic main was tilted, as shown, after accident; consequently, the tar overflow was also tilted.

Opinions of Assistant to Mr. Vernon Harcourt.—Overflows fixed in a temporary way. Seal goes off when that goes down. The exhauster stopping means liquor going up dips and reducing seal. Advisable to raise liquor-level on stoppage of exhauster.

Notes on Gas Burners.

[A paper read at the Annual Meeting of the North of Ireland Association of Gas Managers, by Mr. A. Gibb, of Newry.]

At the solicitation of our Hon. Secretary, and to fill up a few minutes, these homely notes are presented here, and are for the purpose of provoking a good conversation at this meeting.

In the early days of gas lighting, no definite mode of constructing burners was adopted. Every maker followed his own idea—in fact, the principles and perfection of flame were unknown to them. As a consequence of this, immense loss of money and great dissatisfaction prevailed among gas consumers, and if the present consumers growl and grumble with the existing improved burners, we can sympathize with our forerunners in their distress.

Prior to the year 1866, little or no attention was given to the proper construction of gas burners; but since then, there have been vast improvements introduced, so that every other part being attended to, there should be peace at home. The conservatism of some and suspicion of others towards advice from gas managers—blaming them with advancing their own interest; and judging their burners to be more extravagant—have caused many consumers to rush into the arms of the itinerating burner sellers, who perambulate the country and live on the idle conceits of the careless consumers of gas. This feeling has caused language not parliamentary to be hurled at the gas manager; and as you all can testify, there has been no retaliation on our part. We have, "when smitten on the one cheek, turned the other also," and thus produced a better and more kindly feeling among consumers in a great many cases, which it is desired should exist everywhere.

Mr. Sugg, of London, in 1869, in a paper read before the British Association of Gas Managers, gave results of sundry gas burner experiments. I cannot do better than give you his results, as illustrative of the loss accruing from using inferior and badly constructed burners.

The gas used, tested photometrically by the Letheby standard burner, was equal to 14 candles:

In Argands of different makes and patterns, there was a loss of	12.86 to 79.82	per cent.
In batswing burners with steatite tip, a loss of	7.14	"
" " " iron " " "	60.16	"
With fishtail " " " " " "	33.14 to 60.97	"
Amsterdam steatite, with wool in cone,	1.10	"
A steatite burner, compared with an iron burner, varied in value, as regards loss, in favor of the former, from	7.5 to 64.00	per cent.
"London" Argand compared with other makers, varied from	0.0 to 73.50	"

From these examples you will see how important a part good burners play in the development of flame.

Every common flame consists of three parts—the inner layer of unchanged gas, the cone of luminous matter, and the outer shell or covering of complete combustion. The luminosity of flame depends on the amount of solid particles it contains—the richer it is in those particles the brighter the light, and the fewer of these particles there are the poorer the light. In the flames of hydrogen, sulphur and carbonic acid there are no solid particles, and hence they are not light givers; but in gas the particles of carbon are very numerous. "It therefore follows that every circumstance which increases the number of solid particles, within a reasonable limit, or which exalts the temperature of it, increases the light of the flame and prolongs the time of their ignition; and, conversely, everything which destroys the particles or lowers their temperature will also destroy the light."

The proper supply of air to the flame is the point of importance. If too much air is supplied, the flame becomes oxidized and the light is bad. Every burner has its own point of giving its maximum of light; and if this is either increased or decreased, a corresponding injury is developed. When the flame of any gas burner is about to smoke, then is the time of full development or best light.

Temperature, again, improves or vitiates the luminosity of flame; and hence steatite, adamas, or lava, has been substituted for the iron tips which robbed the flame of some of its heat through abstraction and radiation, and took away from the value of the light. Violent chemical action takes place when a flame of gas is evoked, so that any material which withdraws heat should be removed. Hence steatite, in one form or another, is now used.

Over pressure is injurious, because the rush of gas through the burner being increased, too much air is brought into contact with the flame, the solid particles are destroyed too quickly, and some pass off unconsumed; and therefore there is a great diminution of light. Some burners are constructed to obviate this, but the greater number are not. True, over-pressure is to a certain extent prevented in some of the common burners; but consumers are not always alive to this important fact.

The standard "London" Argand burner, as improved by Mr. Sugg, is worthy of consideration. Every part of it has an object in view. The gas is led through three small supply pipes into a larger chamber, and there to a certain extent comes to a state of repose, and so reaches the point of ignition in a quiescent condition; and hence we have such fine results in the development of flame that the Gas Referees have selected it as the standard of light. Anyone can, on the contrary, see the injurious effects of over-combustion by altering the air supply, either by lengthening or shortening the chimney and obstructing the air supply, or preventing the products of combustion passing away freely.

A great improvement was also effected, I believe, by Mr. Sugg, in the mode of cutting the slit on the top of steatite burners. A plain cut was used at one time; but he introduced a circular saw cut, which improved the flame issuing therefrom, and as a consequence developed the light to advantage. Table-top burners were also introduced by him, with the object of deflecting upward currents striking the gas flame.

The Bronner burner was a very early improved burner. Its body is a little longer than usual, and it has a steatite tip. The gas entrance is restricted to a small slit, so as to allow the gas to come slowly and evenly to the burning point. Double burners, with their tips set at certain angles, have never become very popular. Two rat-tail burners being brought to strike against each other improved the light, and led to the formation of fishtail and union-jet burners, now so common.

The various "Codacs" now advertised are certainly a great advance on the single burner. The light is improved, and no extra gas is used. It would suit to give them a trial. The latest "Codac" is that of Williams & Dean. The steatite top is perforated by a series of small holes; and from a circular now before me, the light is said to be increased: From an ordinary No. 1 union-jet burner, 233 per cent.; from a No. 2, 136 per cent.; and from a No. 3, 64 per cent.

Regenerative burners have found their way into the market. They are useful for lighting up large areas, and certainly they do their work satisfactorily. I am sure you have all seen the Siemens, Wenham and other large lights in use, and marked their adaptability to the situations in which they were placed. To a certain extent the inflowing gas to the

burner is heated, and so leads to greater improvement in developing the value of the gas light.

A new London Company has revived the dormant Wenham Company and made some improvements, and certainly the burner looks very well. In June last, I went to Bloomsbury street, London, and had an opportunity of seeing it in operation. The light was remarkably bright and spread all over the room, one burner in a medium-sized room doing this. I was told the consumption was only 4 cubic feet per hour. I also went to a shop in the Tottenham Court Road fitted up with these burners, and certainly every corner of the shop was beautifully illuminated. This same shop had been fitted up with the electric light; but the owner took out all the fittings and put up these new lamps, and he was more satisfied with the gas.

The incandescent gas burners are now so common and so generally introduced, that I need not take up your time about them. Suffice it to say these burners have been a great rival to the electric light. Their superiority as lighthouse lights, for penetration in dark weather, over electricity, has been freely discussed since the unfortunate loss of the "Drummond Castle."

I think I have now said enough to direct attention to this small matter. A burner is not large, yet it can be the cause of much contention and dissatisfaction. The gas now produced is good, being freed from all impurities, and of good illuminating power. Yet how few consumers give due attention to their burners, and if you say the gas is of such a quality, they will quietly shake their heads and say, "Do you expect us to believe that?" Such, at least, has been my experience. I wonder what yours has been?

Loss by Leakage and Unaccounted-for Gas.

At the recent meeting of the North of Ireland Association of Gas Managers, at the suggestion of the President (Mr. T. Frizelle), a "general conversation" on the above-named subjects was gone on with, the topics not having been introduced by a set paper.

Mr. P. J. Salmon, Galway, opened the conversation. He said that, as a general rule, they get a very good yield from their gas works, and what he was now concerned with was the difference between the quantity of gas they got from a ton of coal and the quantity they got paid for. It seemed to him that they all fought shy of that question. He was very badly situated, as he had 12 miles of main with only 200 consumers. He had a quarter mile of 8-inch main, and the rest was 4, 3 and 2 inch, the most part being 2-inch. He found the pressure at the works extremely high for the amount of work to be done, for it required 30-tenths pressure to get the result at the other end of the main. Of course, the consumers complained that they did not get the illuminating power they should. He went into the question some time ago, and he found that though small mains are a great drawback to the gas manager, the greatest loss by leakage occurs in the services. Two months ago he stripped some main and found one section getting away with 12 cubic feet per hour and another with 10 cubic feet per hour. That had been down for some sixty years. Previous to his going to Galway they had a habit of lifting a main that had been down for thirty years and relaying it in a side street and calling it a new main; and one he had lifted was supposed to have been down for sixty years. Three years ago, as he told them on a previous occasion, he made some cement joints, and these he found perfectly good last month. As a rule the services went first at that part which was over the channel. When Mr. Gibb was in Galway, fifteen years ago, he put down some oxidized services, and these were perfectly good from the channel to the main, but they were gone over the channel. He thought the mains should be increased in size, and that the services should be protected where they crossed the channel. Formerly he used the rubber bag when testing mains, but now he had the liquid seal boxes. The prepayment meter was also responsible for unaccounted-for gas. The meter was all very well if they got the consumer to sign an agreement to pay for the gas as registered by the ordinary index; but he found that sometimes there was only a penny in the box for a whole month. In one case there was not even a penny.

The President said that some years ago they had a very heavy leakage in Holywood. It was up to 25 per cent., but now they had got it down to between 9 and 10 per cent. He found that the leakage was not so much due to corroded service pipes as to drawn joints on the leading mains. On one occasion he found every joint in a 16-inch main leaking, some of them having been drawn ¾ inch. In another case he had to examine every joint along a length of three miles of main.

Mr. Salmon said his make was 17,000,000, and he lost 4,000,000 by leakage.

Mr. G. Cummins, Ballymoney, said the question of leakage was one that he had had a great deal of difficulty with. He had actually laid new services where, for distances of 6 to 9 inches, the old pipe had entirely disappeared. He had two different soils to contend with—common peat and red clay—and he found that the peat soil would eat away a pipe while the pipe in the red clay would be perfectly sound. He had put in some galvanized pipes in the hope that they would stand better, but sufficient time had not elapsed to enable him to say whether they would do so or not. He had used services of block tin, but had to do away with them, as they did not last in certain soils. He had had leaks in a 2-inch main where he could obtain a flame from 1½ to 3 inches high 3 feet six inches from the pipe; and he had had flames as high as 18 inches from these pipes. In order to stop these leaks he had to go over the whole system. He found galvanized pipes a great advantage.

Mr. Miller said he had much trouble with service pipes. It was only when the ground was disturbed that these services leaked. He now used steam tube for services, which was not much dearer than the other kind, and only a little harder to screw. He also laid them in a kind of concrete of tar and sand. Pipes thus protected did not show a mark after being down for a considerable time; apparently they would last forever.

Mr. R. Ross, Dungannon, said he was not so badly off as regards leakage. If the services were not disturbed there would be no leakage, but once the ground was broken up the service was gone. With regard to the prepayment meter the ordinary index was the one to go by.

Mr. J. Whimster, Armagh, said the discussion seemed to have been conducted on the assumption that leakage is due to defective mains and service pipes. That was not his opinion. Mains and services had something to do with it doubtless; in some instances possibly a great deal, through the soil subsiding and joints being drawn. But as a general rule, when the mains and services were well laid, he did not think there was much leakage from them. He was led to that opinion by finding cases where the service had entirely disappeared; there was nothing but a hole in the ground, and yet there was no escape. He had seen cases where 18 inches of the pipe had disappeared, but as the soil was stiff clay there was no escape; there was no escape until the ground was disturbed. For that reason he had recently to lay a whole main bare before he could locate a leak, and ultimately he found two breaks a few feet from each other. That fracture was discovered owing to the ground having been disturbed by the laying of a sewer. It should be remembered that when there was an escape from a main or service they were bound to find it out, and therefore he thought the loss of gas from this cause was a very small matter. In his opinion a good deal of the unaccounted-for gas was due to two things. The first was the wet meter. He was a great advocate of the wet meter, but still he thought it was the source of a good deal of loss to them. When he saw that the leakage in a place was 3 or 5 per cent. he said to himself, "They use dry meters there." Two per cent. fast was the most they could get with the wet meter with the water at the highest level; but how long did the water stop at the highest level? Generally the position was the lowest level, with the float working a bit stiff. He thought a good deal of the unaccounted-for gas was due to false registration through the lowness of the water level in wet meters. The second thing was the difference in temperature. In Armagh, where the bulk of consumption was in places of business, the meter was usually in an outhouse or in an underground cellar—the coldest places—and in the shops it was generally about the shop, the door of which was open all day. Consequently, during the bulk of the winter all the gas was measured at the lowest possible temperature, while at the station meter it was measured at normal temperature or at a little higher than normal. They lost at least 5 per cent. of their winter production through difference of temperature, and he should say that they lost somewhere about 3 per cent. from meters, taking an average for the whole year. Although he did not think that mains and services were accountable for the loss of gas, it was right that they should give every care to them, and they should always use the heaviest pipe. He used steam tube coated with red lead for services. He did not think very much good came of the tar protector, because as a rule services had to be renewed before they were worn out. He had had three or four years' experience of prepayment meters, and he did not think very much loss arose from them. He had only one serious experience of loss from them, and that was shortly after he introduced them. The first few meters he had gave him no dissatisfaction, but after that he got some that did give dissatisfaction. In one case he lost between 6,000 and 7,000 cubic feet of gas through one customer. He changed the meter, putting in one that had worked all right elsewhere, but there was no improve-

ment. Then he quietly turned off the gas, and refused to supply that consumer except by an ordinary meter and after payment of a deposit. They used their discretion in the matter of deposits. Taking the year round, he found that the prepayment meters came rather over than under—they were paid for a little more gas than appeared to be consumed. They gave 22½ cubic feet for a penny. He thought the public lamps were also a source of loss to them; he did not think they got paid for all that was consumed, but still he thought they owed something to the public. They got the use of the streets, and if there was a little loss from the lamps they could not help it. The metered lamp was bound to burn a little less than the unmetered one, and then in the winter time there was always a meter going out of order. He never took any notice of that unless it was of long duration, and then he struck that meter out of the calculation.

Mr. D. Williamson, Clones, thought there was a great deal of loss through small mains and bad services. He agreed with regard to the wet meters, but they could be looked after. He thought services should be renewed at the end of a certain number of years, but he had come across services of the existence of which he knew nothing.

Mr. R. S. Carlow, Arbroath, who was invited to speak, said he was very pleased to attend the meeting, and he should go back to Scotland with a very good opinion indeed of the North of Ireland Association of Gas Managers. He thought unaccounted-for gas might be attributed to four things—first, meters; second, public lamps; third, temperature; and fourth, mains and services. Unless the meters were carefully attended to they would explain much of the leakage, as did also the difference of temperature of which Mr. Whimster had spoken. Then where they had coal pits, with consequent subsidences and drawing of joints, the mains had to be very carefully attended to. Some years ago he tested a lot of old meters in Arbroath, and found hundreds of them slow. He destroyed these meters, and whereas then the leakage was 16 or 17 per cent., last year it was only 7.53. Then the public lamps were sometimes a source of annoyance. He had had a number of meters placed throughout the town to ascertain what the lamps consumed. They had Bruce Peebles governor burners, made to burn 3 cubic feet per hour, with 5 cubic feet per hour burners in the corner lamps; and he found that the meters and the governors gave practically the same results. The police kept a note of the hours the lamps were in use, and they got pretty nearly the correct result. Mr. Whimster thought a good deal of the leakage was due to the low water level in the meters, but he did not agree with that, because they all knew that they should have careful men to keep up the level. He thought, on the other hand, that the service pipes were the source of much leakage. When a street was being repaved he took the opportunity to have every service examined. For the last 15 years he had used nothing but lead pipe for services. By making a good connection with the main and using lead services he considered he was doing what was correct, and thereby saving a large quantity of gas.

Mr. A. Gibb, Newry, thought that stating the leakage as a percentage of the make was misleading, as one company might be sending double the quantity of gas through their pipes that another company was sending. Another point was the temperature at the station meter.

Laying Water Mains.

[By Mr. J. H. Decker, Deputy Water Purveyor, Brooklyn, N. Y.]

It is not the intention of the writer to indulge in any fine spun theories, nor to offer any new or startling method of laying water mains, but in a practical experience of upwards of 16 years in the West and South, having been brought into personal contact with a large number of the so-called water works plants constructed by the many "wild-cat" construction companies that cut such a wide swath throughout that country, particularly during the water works boom from 1880 to 1886; and having seen so much trouble resulting from faulty and incompetent planning and laying of the street mains, he believes that a few commonplace, and if you will, commonsense ideas and remarks on this subject will not be out of place before this Association.

It has been repeatedly demonstrated that the large majority of cases of "lack of water" at large fires, insufficient pressure throughout given districts, etc., has been due to errors or negligence in construction of the distribution system.

In planning the distribution system care should be taken to intersect the mains as frequently as possible, to avoid long, unsupported lines, particularly where the pipes are of less than 12 inches in diameter; and never to permit a dead end where it can be avoided. One particular error which obtains in many places, and which cannot be too strongly condemned, is the laying of too small pipes. Pipes of less than 6 inches in diameter should never go into the system.

A liberal use of gates is recommended. Gates are now furnished so cheaply that any water company can better afford to pay for them than to have large districts to shut off, for any slight leak or repair, causing trouble to consumers and seriously hampering the fire department in the event of a fire occurring within the district shut down.

Pipes and Special Castings.—The first step is of course the purchase of the pipes and specials. It is unnecessary here, and not within the province of this paper, to offer any specifications for the manufacture of the pipe. This matter was treated exhaustively by a committee who reported at the meeting held at Philadelphia in 1891, whose specifications cannot be improved upon. It is essential, however, to have the best pipe obtainable. To this end, buy direct from a first-class, reputable manufacturer, preparing your own specifications and insisting upon having the pipe and castings made in strict conformity therewith. This will cost no more than to buy stock pipe and you can have your specials made to suit every angle or curvature in the line of mains.

One of the most important considerations is the reduction to the minimum of the frictional resistance to flow of water. To this end the writer has pipe of 12 inches diameter and over enlarged at the joints, chamtering both at the spigot and hub ends of the pipe. This chamter is for 12 to 30-inch pipes 1¼ and ⅛ inch, and for 36 to 48-inch pipes 1⅛ and $\frac{3}{16}$-inch respectively. Special castings, particularly tee and cross branches and 45 and 90° turns, as made by many manufacturers, are of a very faulty design. In the type too frequently used the fault lies in the curved portion, the radius being entirely too short. In a very much better design, the radius of the curves being much longer, greatly diminishes the frictional resistance.

Trenching and Laying.—Having procured the best pipe obtainable, it is no less important that it be properly laid Too little attention in many cases is given to grade and alignment. "Hills" and "hollows" should be avoided just as far as possible. It is much better policy to pay for a hundred yards of "extra cut" than to have the pipe "humped" up in spots, making air pockets. In no case must the pipe cover rise above the hydraulic grade line. The trenches should always be of sufficient width to permit the pipe to be in all respects well and carefully laid and calked, and to permit of a thorough and satisfactory inspection of the work. The depth in all cases should be sufficient to lay wholly below the maximum frost line. Where practicable there should always be at least 3 feet of covering on the pipes.

All loose rock and boulders should be removed from the trench; a rock surface should not be permitted to remain within 1 foot of the pipe, except in cases where the trench is put through solid rock. In such cases the pipe should be raised clear on the rock surface with blocks of good sound timber and imbedded to a depth of at least 1 foot from its upper surface in sand, loam or clay, which should be thoroughly tamped and rammed in about it. Whenever water should occur in a trench it should be drawn out and kept out until a firm foundation for the pipe shall have been obtained and until the joints have been properly calked. If the bottom should be soft or marshy, and liable to be insecure, it should be made safe and stable with masonry or concrete. In many cases it may be necessary to put in pile foundations for the pipe.

Lines and grades should be given for all pipe lines, particularly where the diameter of the pipe shall exceed 12 inches, and the pipe when laid in the trenches should conform accurately to the alignment and grade given. In all pipe lines where the diameter shall be 20 inches or over, all curves and offsets should be specially designed to meet the requirements, and where practicable the radius of such curves should be not less than 15 feet. If the conditions will admit, 25 to 40 feet will be none too great.

Each pipe, special or gate of 24 inches diameter, should be laid upon two blocks firmly and evenly imbedded in the ground and should be adjusted to line and grade by means of wedges, which should be left in place. The blocks must be sound spruce or other good timber, as the locality may afford, and of a length equal to the diameter of the pipe. For 24 and 30-inch pipe the blocks should be 6 inches wide and 6 inches thick; for 36 to 42-inch, 8 inches wide and 6 inches thick; for 48-inch and upwards, 8 inches wide and 8 inches thick. There should be for each block two wedges made from good sound yellow pine or other equally good timber, 4 inches square, sawn diagonally from end to end, and of length sufficient to cause the angle of the wedge to conform to the periphery of the pipe.

The spigots of the pipe should be so adjusted in the hub as to give a uniform space for lead all around. If from eccentricity of the hub or spigot, or from other cause, such space cannot be obtained, the defective pipe should be rejected. The width of this lead space should at all points be not less than one-fourth of an inch for all pipes of 20 inches

diameter and under, not less than five sixteenth of an inch for pipes 24 to 36 inches, and not less than three-eighths of an inch for pipes of 40 inches and upwards. The depth of the lead in each joint should be for 20 inches, and lesser diameters, 2 inches; 24 to 36 inches, 2½ inches, and for 40 inches and greater diameters, 3 inches.

The gaskets should be clean, sound hemp yarn free from tar braided or twisted and tightly drawn, and should be driven firmly against the head of the spigot and solidly calked up the depth to receive the lead.

The lead used should be of the best quality of pure soft metal, without admixture of any kind. No joint should be poured until the lead has been heated to a temperature of not less than 720° Fahr. and all scoria has been removed. Each joint should be run full at one pouring, for in no case should cold lead be used for calking or filling in. For pipe 12 inches and over joints should be made with a "jointer." The joints should be made by competent mechanics who are capable of calking a perfectly tight joint without overstraining the iron of the pipe, and who, when they have completed their work, have a smooth joint flush with the face of the hub.

All pipe and castings should be carefully cleaned and swept of any dirt or rubbish that may have collected therein, and in addition thereto it is a most excellent plan to have a short wooden cylinder of not to exceed 1 inch less diameter than that of the internal diameter of the pipe, which shall be drawn through the pipe as it is laid. This will prevent the possibility of stones, rubbish, or tools being left inside.

In refilling trenches, clean earth, free from stones or boulders, should be carefully packed and rammed with proper tools, under and to the top of the pipe, particular care being taken to give the pipe a solid bearing throughout its entire length. The earth filling above the pipe should be free from all large rocks or stones and should be put in layers not exceeding 12 inches in depth, each layer being thoroughly rammed or settled with water to render the whole filling compact and solid.

Gates of 20 inches or less diameter may be made with direct spindles and but set vertically, and should be covered with a good large iron gate box. All gates over 20 inches should preferably be geared and set horizontally, and should also be provided with by-passes of suitable diameter. These should be set in good roomy brick vaults fitted with proper manholes with iron frames and covers.

On all trunk mains blow-offs of suitable size should be placed at all low points. These blow-offs should be connected by proper pipes to the sewer, where there is such, or to a well constructed for the purpose, where there are no other ready means of disposing of the water blown off the mains.

At all high points air cocks should be put in to free main from any accumulation of air. These air cocks should be covered with large iron gate boxes, or with brick chambers with manhole and cover, as the exigencies of the case may demand.

The writer is now in charge of the laying of about 9 miles of 48-inch main for the city of Brooklyn. This is the third main of that size in the city, and with two lines of 36-inch comprise the trunk mains of the distribution system. In preparing his specifications he has embodied all of the foregoing points. All of the 36 and 48-inch gates for this line are operated by hydraulic cylinders which are guaranteed to open or close the gates against a pressure on the main, due to a head of 175 feet, with 25 pounds pressure. The weight of these 48-inch gates is about 12 tons; the average weight of the pipe, which is $1\frac{5}{16}$ inches thick, 8,200 pounds per length.

The pipe was all received at the dock on lighters; to distribute it, it was by means of a swinging derrick lifted from the lighter and loaded directly upon trucks, and which hauled it to the place required. To unload, a derrick was rigged upon wheels and drawn alongside of the truck, the pipe picked up and deposited upon the ground. In laying the pipe in the trench, an ordinary double A derrick operated by hand was used.

The work was commenced October 10, 1895, and was continued throughout the winter with comparatively few interruptions. It is expected that the entire work will be completed within nine months time.

The pipe is laid with four feet covering, making the trench average 8 feet 4 inches in depth. The average number of lengths laid and calked per working day has been 20; in quite a number of days over 40 lengths were laid, and in two days, 45 lengths.

As each section, averaging 5,000 feet of this main, is laid, the specifications require that it shall be subjected to a hydrostatic pressure of 200 pounds to the square inch, which shall be maintained for at least one hour.

To sum the matter up, the requisites for a perfect and satisfactory distribution system are, a competent engineer, carefully prepared specifications, well made pipe and castings, with a liberal supply of cross-connections and gates, and withal an honest and intelligent inspector.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. E. F. Sherman has resigned the position of Superintendent of the East Portland (Oregon) Gas Light Company in order that he might accept an offer to assume the duties of Assistant Superintendent to the Cambridge (Mass.) Gas Company. He goes to Cambridge on Oct. 1st.

The following is the text of the contract which the canvassers for business for the Ogden Gas Company, of Chicago, are offering to the notice of gas consumers: "In consideration of the Ogden Gas Company, a corporation organized under the laws of Illinois, hereby agreeing to lay its gas pipes within ——months of the date hereof, in or along the street or alley in Chicago, Ills., on which the premises herein below described, and upon which I now do business or reside, abut, I agree to purchase from said Company all gas of standard quality which shall be required or used by me or by my family in, upon or about said premises for the period of three years from the date that said Company is ready to furnish gas; and said Company agrees to and shall be (unless prevented by causes beyond its reasonable control), ready to furnish such gas within ——months from date. During said period of 3 years I agree that no gas required or used by me or my family in, upon or about said premises shall be supplied by, purchased or procured from any other Company or individual. I agree to pay for such gas to be supplied hereunder each month, within 15 days of the date of the bill, at the rate of 90 cents per 1,000 cubic feet, to which shall be added a penalty of 10 cents per 1,000 cubic feet if said bill is not paid within 15 days from the date thereof. The said Company agrees to run all necessary pipes for the furnishing of gas main to the curb line, or into the building constituting said premises, or of which said premises are a part, making all necessary connections without expense to me."

In connection with the Ogden Gas Company, and the efforts of its promoters to secure the necessary permission from the Chicago authorities, the following editorial, from the Chicago *Tribune* of August 25th, may prove of interest: "Ex-Congressman Forman calls on Governor Altgeld to explain his veto of the frontage bill, which provided the Council should not grant a franchise to a gas company, unless the owners of more than half the frontage petitioned for it. This was called a boodle bill by Altgeld. The man who went to Springfield and remained there through the session working for this bill was Altgeld's relative and business associate, Lanehart. He was at the head of the Ogden Gas Company, which had recently secured a franchise. At that time negotiations were pending for the purchase of that franchise by the gas trust, conditioned on the passage of the frontage bill; for the gas people believed its enactment would put an end to the granting of speculative franchises by the Council. Mr. Forman asserts that if Lanehart had known Altgeld was going to veto the bill he would have gone home and not solicited votes for it. But he remained and got the measure through both Houses, only to see it vetoed. Forman would like to know why it was vetoed—whether the negotiations as to the purchase of the franchise failed or whether Altgeld was afraid to sign it. Since the Governor is interested in the Ogden Gas Company, and is a member of the Board of Directors, Mr. Forman thinks he must be familiar with all the facts, and suggests that he make such explanation as will 'convince your admirers that you are above suspicion.' This is a reasonable request. Will Altgeld hasten to comply with it when he returns?"

Mr. Wm. Strebbing Bruce, at one time President of the Memphis (Tenn.) Gas Light Company, died at his home in Memphis on the night of August 22th. Deceased was born in Philadelphia, November 1st, 1819. While an infant his parents removed to Ohio, and in due time he acquired an education and commenced his business career in Cincinnati. In 1843 he went to Memphis, with two of his brothers, the trio engaging there in the carriage manufacturing business, in which they were remarkably successful. He was interested in many things connected with the solid business affairs of Memphis, and was always prominent in advocating measures that stood for the better development of the city where the greater part of his useful, active life was spent.

Mr. H. M. Stocum, Manager of the Tonawanda (N. Y.) Gas Light Company, writing under date of August 31st, says: "We note, in your issue of August 31st, 1896, a remark to this effect: 'If Mayor Hooper's[1] plan proves successful the present style of gas lamp will gradually disappear from the city's streets.' The Tonawanda Gas Light Company, desiring to be up to date, placed, at its expense, 182 street lamps, of the J. G. Miner type, No. 2, fitted with Welsbach burners and suitable bye-

1. Mr. Hooper is Mayor of Baltimore, Md.

pass, on July 1st, 1896, and the lamps have proved a success. They light the streets in a more satisfactory manner than was done by the electric lights, and for indoor lighting the Welsbach burner is fast displacing incandescent electric lamps. Our patrons find that the former is more economical and reliable."

It is said that the authorities of Palmyra, N. Y., have granted to "George Olney and his associates" a franchise for the operation there of a gas works. Palmyra is a post village of a similarly named township in Wayne county, N. Y. It is located on the Erie canal, also on Mud creek, and the Central Railroad passes through it. The place is about 22 miles east-southeast of Rochester, and it is both handsome and prosperous. The population of the village is something less than 2,500. We are afraid, however, that beauty and prosperity are not of themselves sufficient guarantees that a place possessing both only in comparative degree will afford lucrative business for a gas plant; and our belief that Palmyra was soon to have a gas works would be all the more pronounced were the franchise for its erection and operation in the possession of others than Mr. Olney and his associates.

A special meeting of the shareholders in the San Francisco Gas Light Company, to act upon a proposition for the merging of that Company with the San Francisco Edison Light and Power Company, has been called. The date named is October 26th.

Mr. James R. Voorhees has been elected Secretary and Treasurer of the Morristown (N. J.) Gas Light Company, vice Mr. Edward Pierson, deceased.

The advent of Mr. Charles A. Learned to the Superintendency of the Meriden (Conn.) Gas Light Company seems to have been a good thing for the Company, for we notice that the proprietors have at last consented to a sensible investment in main extensions. In fact, the Company has, through public announcement, proclaimed its willingness to put mains under the roadways of any district in which a certain number of the residents declare their desire for a gas supply.

At the annual meeting of the Knox (Me.) Gas and Electric Light Company—the Company also controls the Rockland, Thomaston and Camden Street Railway Company—the following result was reached: Directors, G. E. Macomber, John F. Hill, E. K. O'Brien, H. L. Shepherd, W. T. Cobb, W. S. White and S. M. Bird; President, G. E. Macomber; Treasurer, A. D. Bird.

The usual quarterly dividend (2 per cent.) of the Troy (N. Y.) Gas Company, is payable on demand.

Mr. S. W. Van Syckel has secured control of the plant of the Petaluma (Cal.) Gas Light Company, through the purchase of the Wickersham interests therein. He will remodel the works and in all probability adapt the plant to gas making under the Van Syckel system.

The Hazelton Boiler Company, of 716 East 13th street, New York, is erecting a battery of 500 horse power, of the Hazelton or porcupine type, in the works of the New York Equitable Gas Light Company, 41st street and First avenue. It is to be a very handsome plant, and will illustrate several novel features, which cannot fail to interest those engaged in the manufacture of gas.

The proprietors of the Sioux City (Ia.) Gas Light Company have, through their President, Mr. Samuel T. Bodine, formally notified the authorities of their acceptance of the extension of the Company's franchise for a further period of 20 years.

A correspondent forwards the following mention of a suit, based on rather an odd statement: "The Davenport (Ia.) Consolidated Gas, Electric Light and Steam Heating Company has been made defendant in a suit brought by James Evans. Plaintiff alleges that defendant was excavating for gas mains, poles, etc., on Iowa street, Davenport, and in the carrying out of such work was using dynamite and other explosives. Plaintiff, at a certain time, was unloading hay from a wagon, to which was hitched a pair of horses, when an explosion in a ditch of the defendant resulted in a violent upheaval of earth and stones. Portions of the latter in falling dropped upon the roof of the barn, into which the hay was being placed, with noise loud enough to cause the team to break loose from the hitching post. Plaintiff was thrown to the ground from the wagon and sustained personal injuries of a severe nature. He alleges that defendant failed to use ordinary precaution in carrying on its blasting operations, that the drilling was too shallow, and that the covering for the blasts was altogether inadequate. He asks for damages in the sum of $5,000, and his attorneys are Messrs. Henry & Fisher."

The new plant of the Lebanon (Pa.) Gas Company, which is of the modern coal gas type, and of a capacity up to 100,000 cubic feet per day, was formally put into action towards the close of last month. The Company expended about $22,000 in the construction noted.

Mr. S. H. Woods, of Cedar Falls, Ia., is the latest aspirant for a gas franchise for Des Moines, Ia. He proposes to go on under the acetylene system, wherefore we imagine that the proprietors of the Capital City Gas Company will continue to do business for some time in Des Moines. Mr. Woods says that carbide of calcium can be "laid down" in Des Moines for $35 per gross ton, over which we congratulate him, for it cannot be "laid down" in New York for even twice the named figure.

The Springfield (Mass.) *Republican* has this to say about the queer action of the Selectmen of West Springfield, in respect of the gas supply of the latter place: "A good deal of hard feeling has been aroused by the strange action of the Board of Selectmen in placing such prohibitive restrictions on the Springfield Gas Light Company as to practically shut it out from making certain large extensions of its pipe lines which it had been petitioned to do by many abutters on the various streets of West Springfield. The Gas Company invested about $5,000 in the town last season, with very few takers and with a small prospective increase, and at the request of citizens on various other streets consented to extend the main again this season to about double the length of that previously laid. As this property is all taxable this policy is all the more difficult to understand, for not only does it shut off numerous citizens of the town from a convenience which they desire to avail themselves of, but it also shuts off some desirable revenue. It is to be hoped that the Selectmen will retrace their steps from the position they have taken in the matter and so modify the franchise that the Gas Company will not be delayed until after the election of another Board."

The Board of Public Works, of Denver, Colorado, has asked the Denver Consolidated Gas Company to pay $3,000 towards the amount necessary for the repaving of certain Denver streets with asphalt.

Capt. W. H. White, the Eastern representative of the Western Gas Construction Company, has closed a contract with Messrs. William Knowlton & Sons, of West Upton, Mass., the well-known hat manufacturers, for the installation on their works of a water gas plant of the Western Construction Company's improved Lowe type. This plant is to have a daily capacity of 100,000 cubic feet and replaces a rosin gas plant that the Knowltons have had in use since 1867. The contract calls for the enlargement of the generating structure and the construction of a new house, to hold purifiers (2 boxes, 8 feet square); station meter, etc. A holder capable of storing 30,000 cubic feet will form a part of the plant, and the contract for its construction was awarded to Messrs. R. D. Wood & Co.

Interior Lighting.

Engineering Magazine for September notes that a writer in *Electrical Plant*, starting from the assertion that, unlike exterior lighting, interior lighting, on account of the complexity of conditions, is not amenable to mathematical computation, holds that there are two main requirements, which everyone dealing with lighting questions should aim to secure. In the first place a certain intensity of illumination should be fixed upon as necessary to the convenient performance of the particular occupation or occupations commonly carried on in the room in question. Obviously, a greater intensity of illumination is necessary in some rooms than in others, as in places where very fine work, requiring a great deal of light, is performed; but, generally speaking, rooms for lighting purposes may be divided into three classes, viz., dwelling rooms, workshops and offices, for each of which a special intensity of illumination is desirable.

In the second place, a uniformity of illumination should be aimed at, and in those cases where only a good effect is required, and where work requiring high intensity of illumination is not carried on, the question of uniformity of illumination is the most important one for consideration. If the different points of light are so distributed that there is no one spot which looks darker than another, even if the absolute illumination is of a low grade, the room in question will have the appearance of being brilliantly lighted.

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The author holds, also, that, in large rooms the ordinary method of fixing small units of light, at equal distances from each other upon the ceiling, is faulty, that uniform distribution is not thus secured, and that to approximate to uniformity of illumination the lamps must be concentrated towards the outer boundary of the area to be illuminated.

If, instead of using five hundred 16-candle power lamps, distributed at equal distances throughout the area to be illuminated, 25 groups of twenty 16-candle power lamps are arranged at equal distances throughout the area, the light at the central point is in the case of the grouped lamps less than in the first case; the fewer the sources the less the total illumination at the center, and although the points near the centers of the lamps will be much more strongly illuminated than corresponding points near the single lamps, the intensity at any point of minimum illumination will be less. The total candle power will, however, require to be greater with few than with many lights.

Working in Compressed Air.

E. W. Moir, in a paper read before a recent meeting of the Society of Arts, gave some interesting data regarding the effects upon the human system of working in compressed air and the various practical means of lessening the danger and overcoming any sudden collapse. Mr. Moir had charge of the work on the Hudson River Tunnel for a time, and has had some connection with most of the underground tunneling ventures of the past two decades. He says: "When I first came to New York the men had been dying at the rate of one man per month out of 45 or 50 men employed, a death rate of about 25 per cent. per annum. With a view to improving this state of things, an air compartment like a boiler was made, in which the men could be treated homeopatnically, or reimmersed in compressed air. It was erected near the top of the shaft, and when a man was overcome or paralyzed, as I have seen them often, completely unconscious, and unable to use their limbs, they were carried into the compartment, and the air pressure raised to about one-half or two-thirds of that in which they had been working, with immediate improvement. The pressure was then lowered at the very slow rate of 1 pound per minute, or even less, the time allowed for equalization being from 25 to 30 minutes, and, even in severe cases, the men went away quite cured.

"No man ever suffers by going into compressed air, unless his Eustachian tubes are blocked, in which case intense pain is produced, owing to the great difference in pressure between the two sides of the ear drum. The above described lock should be used immediately on prostrations occurring, as it seems to be of little value after some time has elapsed. A very slight increase of carbonic oxide (if it much exceeds one part in a thousand) in the compressed air chamber leads to increased sickness. The impurity never affects a man while below, but only after he comes out, and we had mules working under pressure in New York for over twelve months at a stretch, which sold at good figures after coming out. Every man should be medically examined, and hot coffee should be given to each man before he comes out of compressed air. A warm room to dress in and extra clothing for passage through the lock should be supplied. At the Blackwall Tunnel, with the experience gained and attention to the above points, we have not had a single death, notwithstanding the fact that we had men working under a pressure of 37 pounds per square inch for some time. Generally sparely built men, not too full-blooded, are those who stand air pressure best. A man with weak lungs may work and improve, but one with a weak heart or any apoplectic tendency should not go in at all. Drink of all classes is bad, but such drinks as tend to thicken the blood are worse than spirits."

The Market for Gas Securities.

Returning confidence in the financial situation was strongly evidenced on the Exchange since time of last writing, the result of the Vermont election being so greatly in favor of the party that favors sound money, that investors were not slow in placing orders for bonds and stocks of the right sort. The speculative element, too, was out in force with its punting, and the job lot shares also scored noteworthy gains. Consolidated opened to-day (Friday) at 144½ to 145½, and by noon had sold at 146. It is possible that realizing sales may carry it to a temporarily lower level, but all the indications point to a marked increase in its value, as rated by Exchange quotations. Other city gas shares are stronger, which is particularly the case in New York and East River common and preferred, and in Equitable. The Standard shares show no particular change, but the undertone respecting them is all in the direction of higher figures. Brooklyn Union moved up 5 points in the bid price, and the next week ought to show another 5 point increase. Chicago gas sold at 59⅛ this morning. Investors should not lose sight of the fact that a round dividend on Chicago may be declared on very short notice. Baltimore Consolidated has advanced to 58½ bid, and Bay State is virtually lifeless, at 15½ to 16. At those quotations we think a fair turn could be speedily made in it for long account. Laclede common is another gas specialty that recovered sharply from the ridiculously low prices at which it was quoted for the past month. The opening to-day came in at 21 bid for the common. The San Francisco Company has called a shareholders' meeting for October 26th, when the proposition to merge its interests with those of the local Edison Company will be voted on.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

SEPT. 7.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,490,000	100	144½	145½
Central	500,000	50	150	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	190	195
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	210	215
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
Northern	150,000	50	79	80½
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	27	30
Preferred	2,000,000	100	57	67
Bonds 1st 5's	3,500,000	1,000	95	97
" 1st Con. 5's	1,500,000	..	83	86
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	
Standard	5,000,000	100	71	74
Preferred	5,000,000	100	99	101
Bonds, 1st Mortgage, 5's	1,500,000	1,000	107	111
Yonkers	299,650	50	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	85	85½
" " Bonds (5's)	15,000,000	1,000	103	104
Bay State	5,000,000	50	15½	16
" Income Bonds	2,000,000	1,000	30	32
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	75	80
2d " " "	3,000,000	1,000	60	62
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	58¼	58½
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds.	7,650,000	1,000	94	94¼
Columbus	1,069,000	..	..	65
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	..	76
" Bonds	600,000	1,000	95	.
Cincinnati G. & C. Co.	7,000,000	100	194	..
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	41
Bonds (6's)	150,000	1,000	.	
Consolidated, Baltimore	1,000,000	100	58½	59½
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910.000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	..	32	33
" Con. Bonds	4,312,000	..	..	82
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	78	83
" Bonds	2,000,000	..	85	90
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	115	130
" Bonds, 6's	2,650,000	..	99	101
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	..	90
Bonds	1,000,000	1,000	85	90
Louisville	2,570,000	50	.	..
Laclede, St. Louis	7,500,000	100	21	21½
Preferred	2,500,000	100	.	80
Bonds	9,034,400	1,000	87	87½
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.

Newark, N. J., Gas Co.	1,000,000	..	93	98
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	52	53¼
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	2,100,000	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	83	..
Consolidated 5's	2,000,000		87½	90
San Francisco, Cal.	10,000,000	100	86½	87
St. Paul Gas Light Co.	1,500,000	100	67½	70
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	500,000	25	..	..
Washington, D. C.	2,000,000	20	250	
Western, Milwaukee	4,000,000	100	50	51
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DIVIDEND NOTICE.

OFFICE OF WELSBACH COMMERCIAL COMPANY,
40 WALL ST., NEW YORK CITY, Aug. 13, 1896.

The Directors have this day declared a quarterly dividend of two (2) per cent. on the preferred stock, payable on Sept. 10, 1896, to stockholders of record at the close of business Aug. 29. The Transfer books of the preferred stock will be closed from Aug. 31 to Sept. 10, both inclusive. Checks will be mailed.

1107-3 EDWARD C. LEE, Treasurer.

WANTED,

By a young man of several years' experience in all branches of the business—construction, manufacturing, mechanical and clerical—a position to take full charge of works as Supt. of manufacturing and distribution. At present in charge of works sending out 15,000,000 feet annually; 25 per cent. increase in business of same for year 1895 accomplished by the sale of stoves and Welsbach lights. A position where increase of business, improvement of property, economical management and good service will be appreciated. Has had 20 years' experience, and not afraid of work. Coal gas works preferred. Gas companies and well-known gas engineers as references. Salary reasonable. Address

1109-4 "T. V. P.," care this Journal.

Situation Wanted.

A Practical Prover of Gas Meters

wants a situation with a Gas Light Company. Can do repairing. Is steady, and can furnish good references. Twenty years' experience. Address

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HOLDS at present a subordinate position with a large stock company. Is looking for a position where he will be under an older man at a large works.

OBJECT OF CHANGE: More money. Will work for $1,400.

CONCERNING ABILITY and character, would refer to present employers.

Address, care of this Journal,
RICHARD A. VAN WYCK.

Situation Wanted

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1008-3t "S.," care this Journal.

WANTED,

Position as Superintendent of Gas Works,

by a capable, energetic and economical manager. Over five years with present Company. Good reasons for desiring a change. Address

1102-tf "H. G. E.," care this Journal.

Position Wanted

As Superintendent of Gas Works or Gas and Electric Light Works.

Has been in the employ of the Long Branch (N. J.) Lighting Company as Superintendent for the last 11 years, and is a practical mechanic, thoroughly understanding the laying out and erection of plant and the making of coal and water gas. Best of references. Address CHAS. J. LUTHER,

1106-5 Box 142, Long Branch, N. J.

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As Superintendent of Gas Works or Gas and Electric Light Works,

By a man 34 years of age. Sixteen years' experience in the manufacture and distribution of Coal Gas as Supt., and four years in the Electric line. Thoroughly competent to take charge of any plant, separately or combined. A practical mechanic, and understands the erection of gas plants and everything pertaining to the business. Not afraid of work. Salary no object until ability is proven. Best of references.

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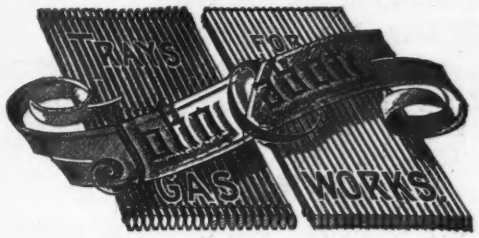

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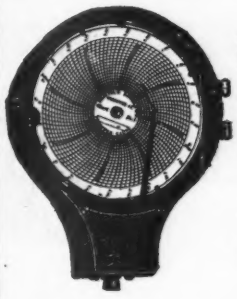

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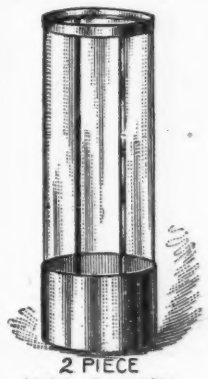

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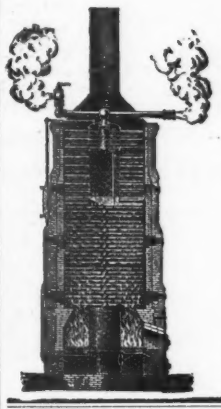

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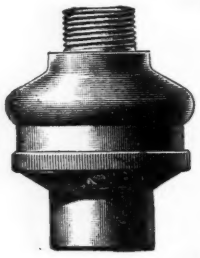

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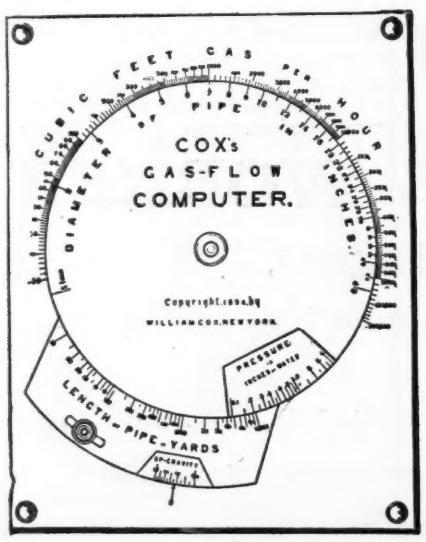

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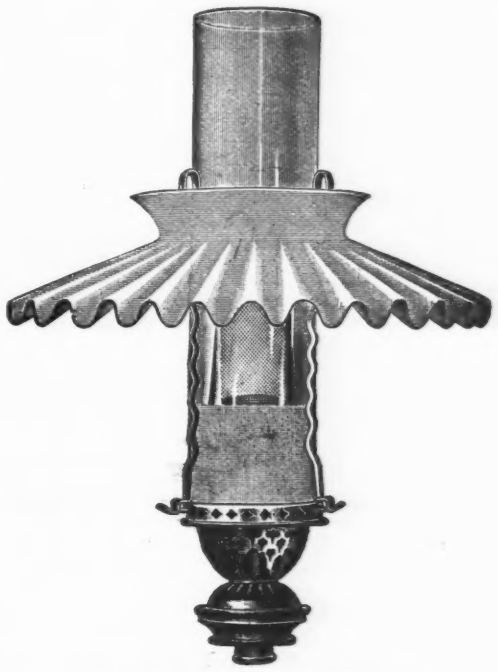

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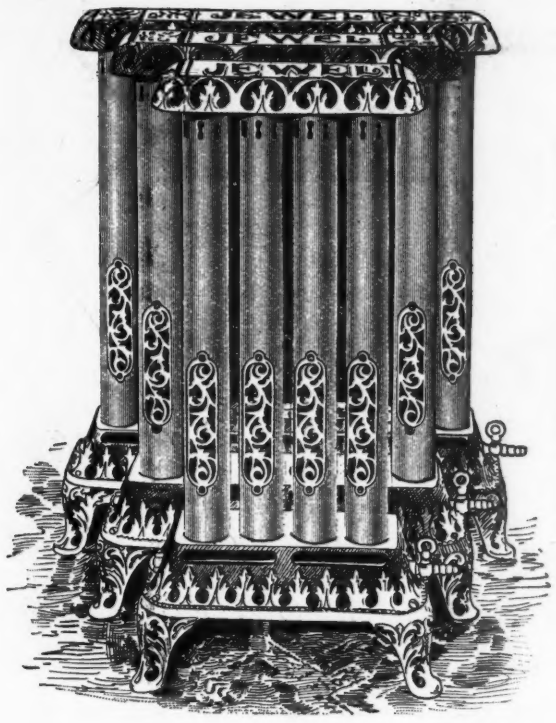

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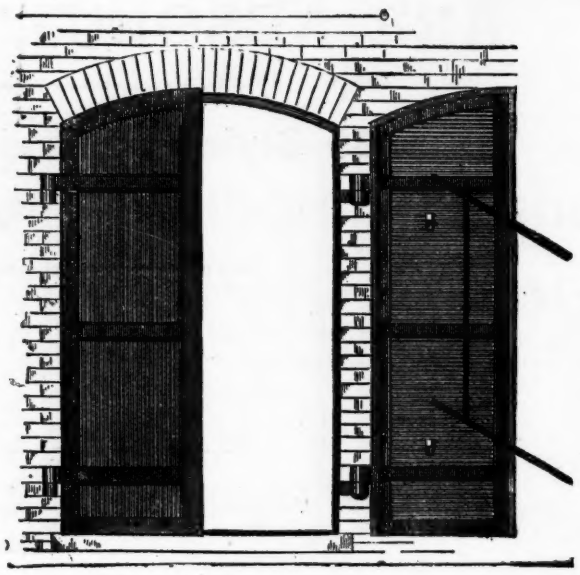

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PUBLIC LIGHTING TABLE.

SEPTEMBER, 1896.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Tue.	1	7.00 PM	12.30 AM	6.30	4.20
Wed.	2	7.00	1.30	6.30	4.20
Thu.	3	7.00	2.40	6.15	4.30
Fri.	4	7.00	4.30	6.15	4.30
Sat.	5	7.00	4.30	6.15	4.30
Sun.	6	6.50	4.40	6.15	4.30
Mon.	7	6.50 NM	4.40	6.15	4.30
Tue.	8	6.50	4.40	6.15	4.30
Wed.	9	6.50	4.40	6.15	4.30
Thu.	10	6.50	4.40	6.05	4.40
Fri.	11	6.50	4.40	6.05	4.40
Sat.	12	8.10	4.40	6.05	4.40
Sun.	13	9.00 FQ	4.40	6.05	4.40
Mon.	14	10.00	4.40	6.05	4.40
Tue.	15	11.10	4.40	6.05	4.40
Wed.	16	12.10 AM	4.40	6.05	4.40
Thu.	17	1.20	4.40	5.55	4.50
Fri.	18	2.20	4.40	5.55	4.50
Sat.	19	3.30	4.40	5.55	4.50
Sun.	20	No L.	No L.	5.55	4.50
Mon.	21	No L. FM	No L.	5.55	4.50
Tue.	22	No L.	No L.	5.55	4.50
Wed.	23	6.20 PM	7.20 PM	5.55	4.50
Thu.	24	6.20	7.50	5.40	5.00
Fri.	25	6.20	8.10	5.40	5.00
Sat.	26	6.20	8.50	5.40	5.00
Sun.	27	6.10	9.30	5.40	5.00
Mon.	28	6.10	10.20	5.40	5.00
Tue.	29	6.10 LQ	11.20	5.40	5.00
Wed.	30	6.10	12.20 AM	5.40	5.00

TOTAL HOURS LIGHTING DURING 1896.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	220.40	January	423.20
February	207.00	February	367.40
March	193.00	March	355.35
April	174.10	April	298.50
May	164.00	May	264.50
June	142.10	June	234.25
July	142.10	July	243.45
August	150.50	August	280.25
September	163.00	September	321.15
October	193.10	October	374.30
November	207.00	November	401.40
December	237.30	December	433.45
Total, yr.	2194.40	Total, yr.	4000.00

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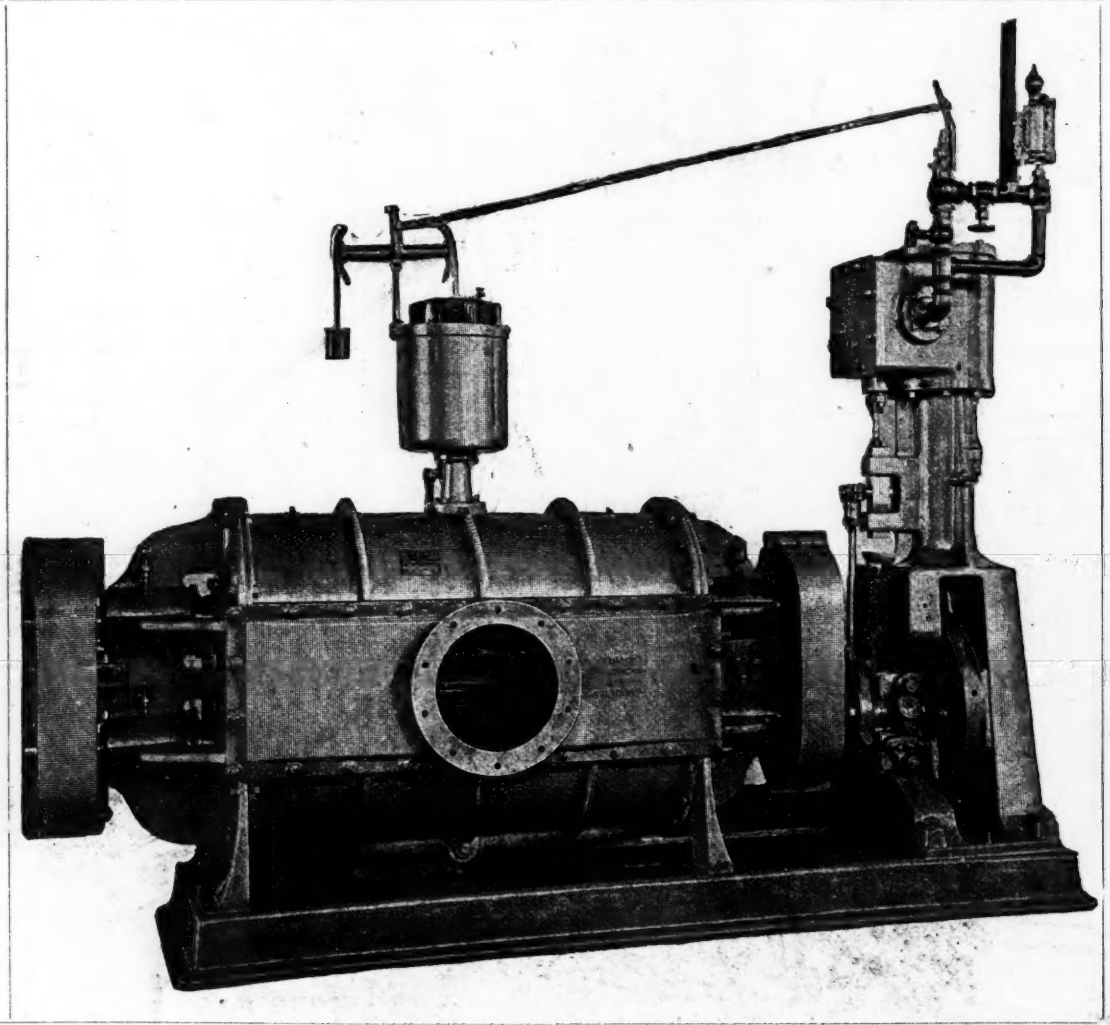

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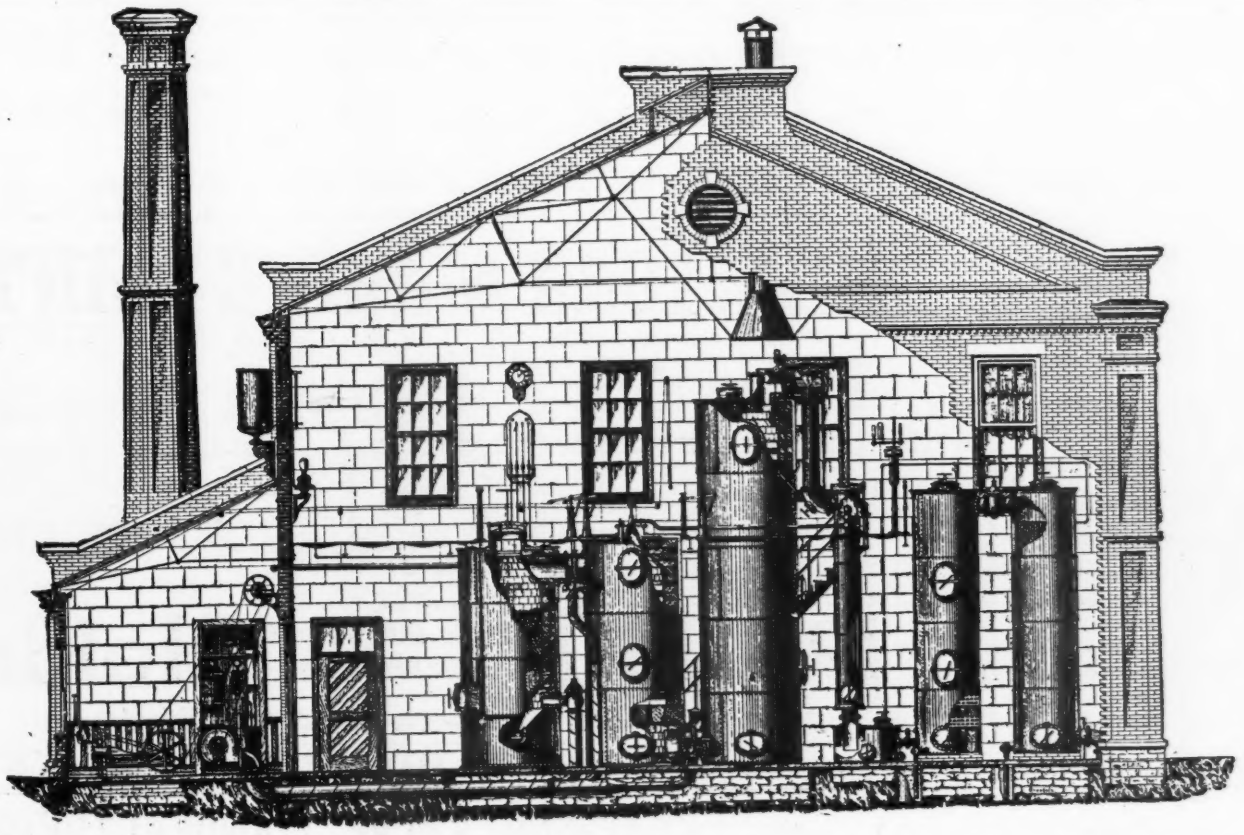

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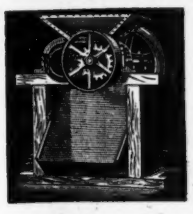

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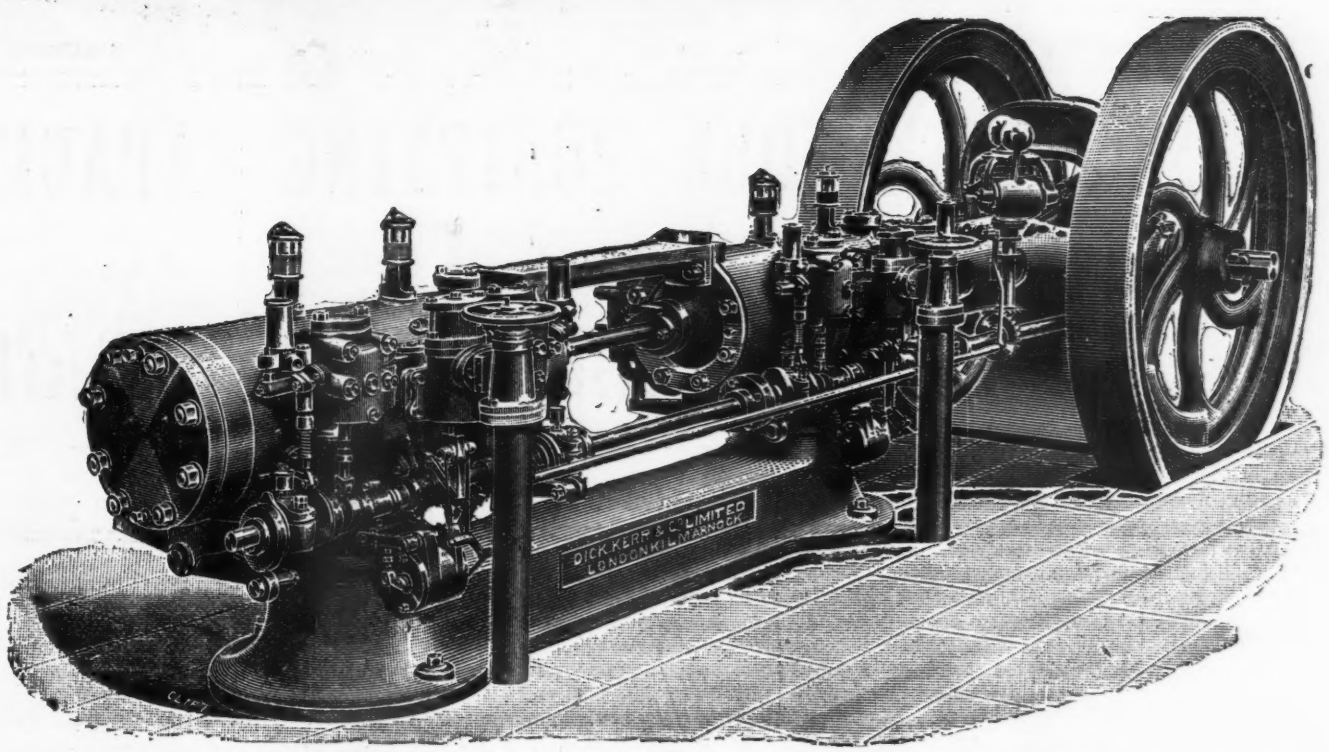

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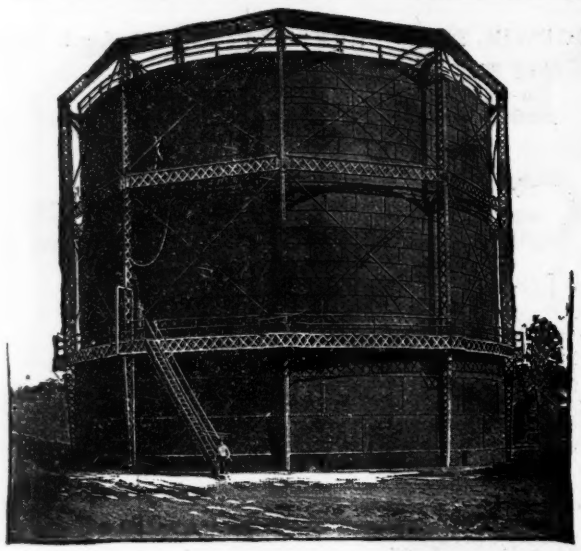

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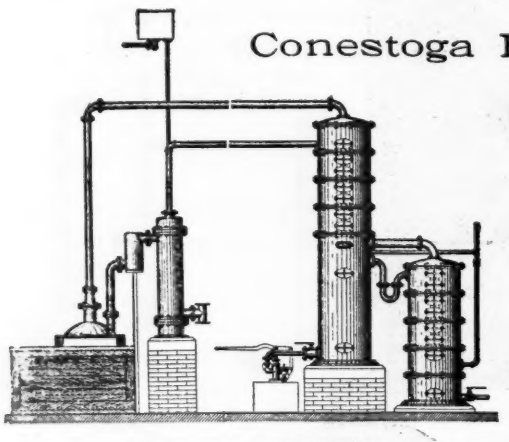

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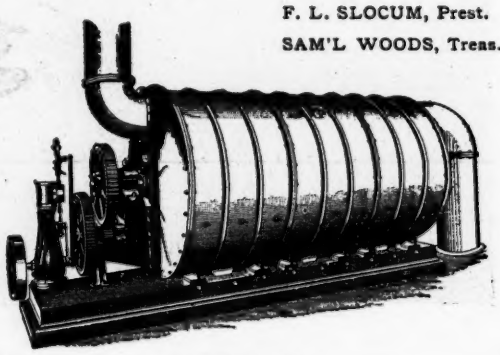

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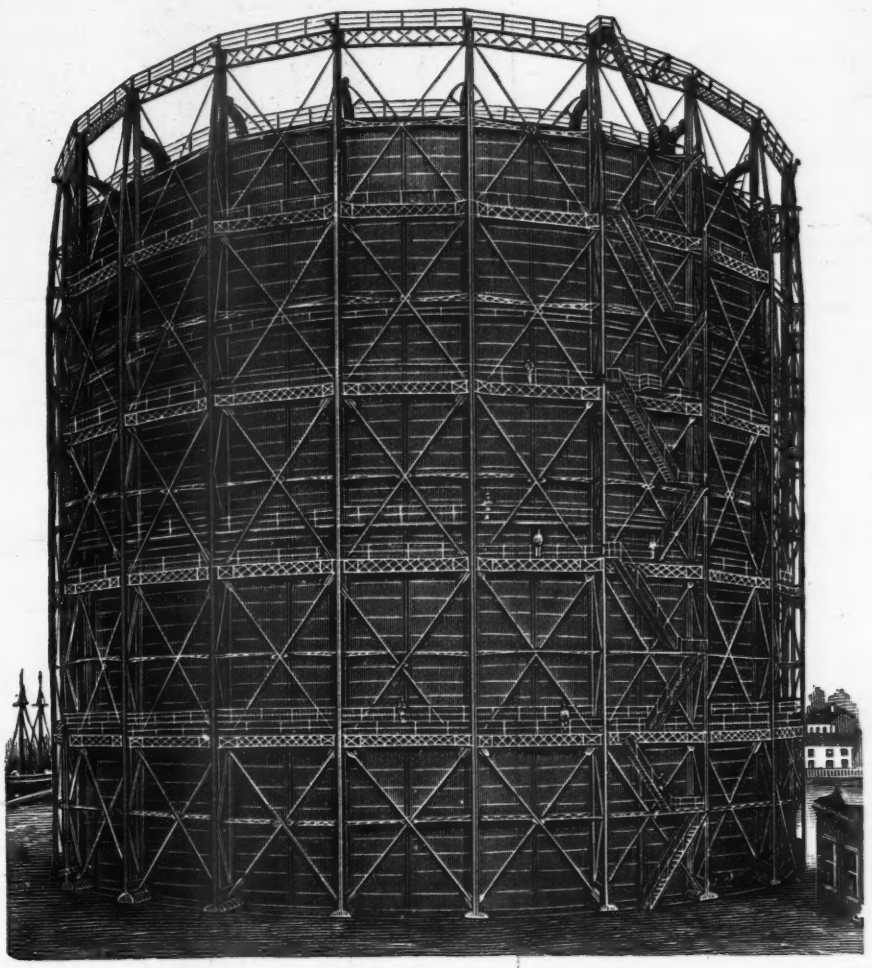

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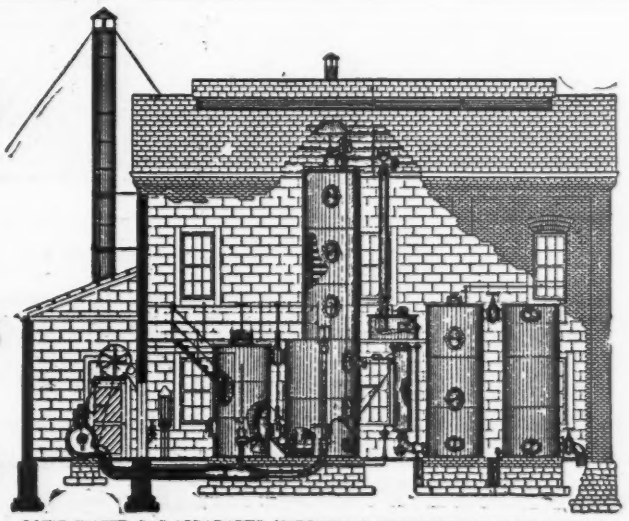

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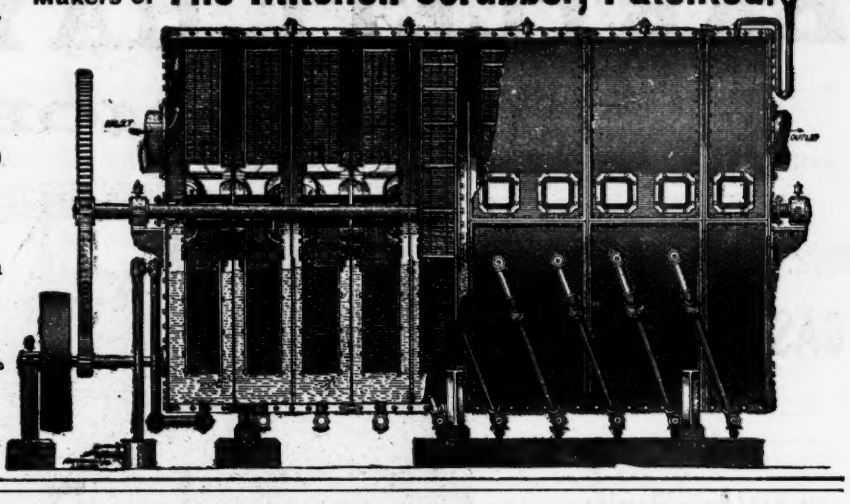

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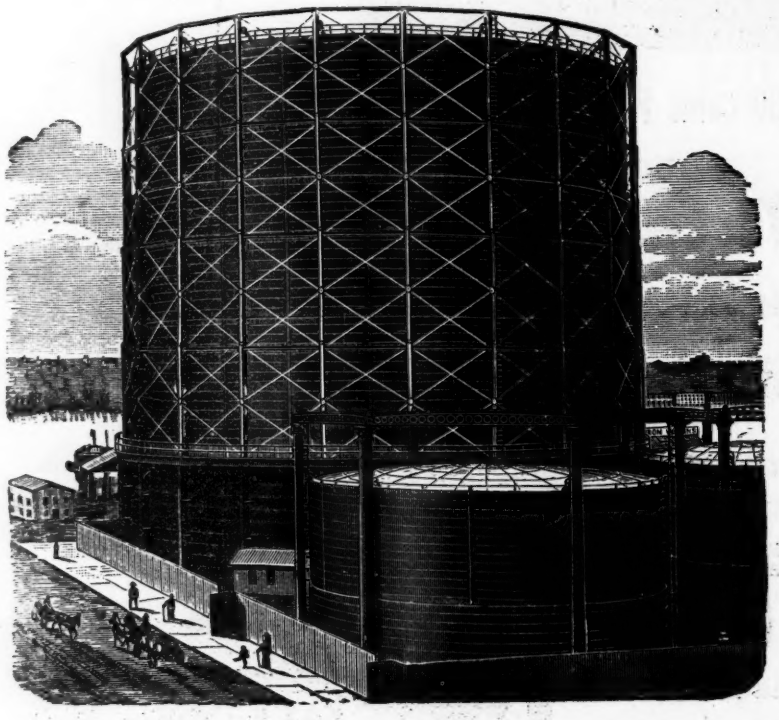

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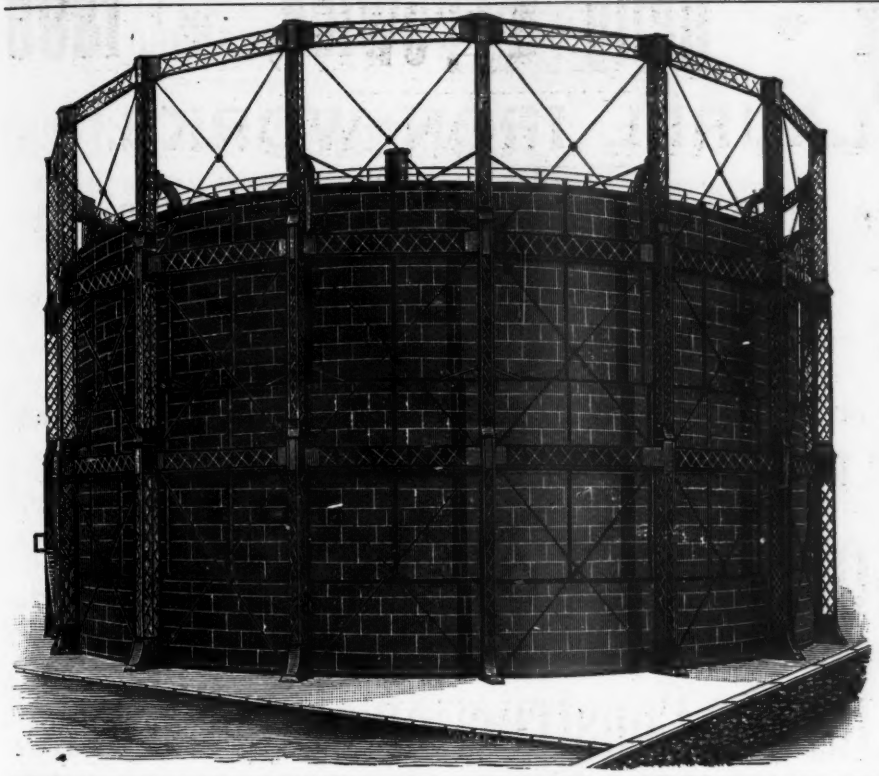

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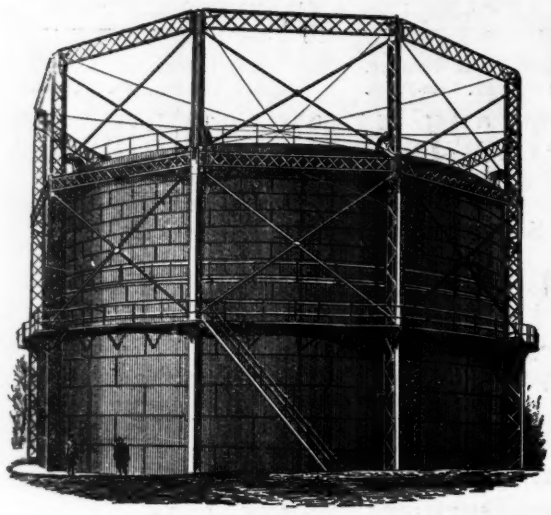

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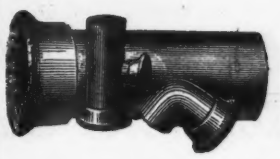

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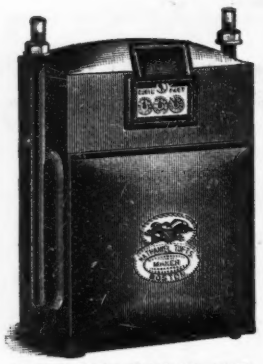

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